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[For comparison of systems of land tenure in Ceylon, Burma, Thailand, Sumatra, Java, Borneo and of the hill tribes of India with that of Malaya, see Source 58: Maxwell, pp. 82-89, category 116, AN1 Malaya. --Analyst]

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During untold centuries in which they collected plant matter, women acquired an intimate knowledge of vegetable life. Eduard Hahn and others have therefore reasoned that women were the inventors of the cultivation of plants and hence were the first food producers. Hahn has given the name *Hackbau* (hoe culture or hoe tillage) to primitive cultivation, and maintains that the hoe is woman's implement; he draws a sharp distinction between Hackbau and more advanced cultivation, which he calls *Pflugbau* (plow culture or plow tillage) and ascribes to men.[9] It is indeed true that men generally farm with plows and that many examples may be cited of women using hoes; nevertheless, there are so many instances of male primitive cultivators employing hoes or similar instruments that Hahn's classification should be modified. While there seems to be no reason for abandoning his theory of the invention of plant cultivation by women, the classification of cultivation by tools, such as the hoe and the plow, ascribed to one sex or the other, is unsatisfactory. For, in spite of the fact that the collection of vegetable matter is almost exclusively the woman's task in the gathering economy, among primitive cultivators men either assist women in the cultivation of plants or entirely take over this activity whenever hunting or fishing become less important than soil tillage. Furthermore, many primitive cultivators do not use the hoe, but continue to employ the digging stick, characteristically used by the food-gathering women. From Formosa southward throughout the Malay Archipelago, as well as on the mainland of Southeastern Asia, the digging stick, also known as the dibble stick or planting stick, is frequently used by the primitive cultivator. On the other hand, there are advanced cultivators who till their land intensively with hoes; they use manure, rotate their crops, terrace fields that lie on slopes, and practice irrigation, yet they do not use plows drawn by draft animals (however, in some instances they have livestock). In other words, advanced agriculture does not depend upon the animal-drawn plow nor does primitive agriculture depend upon the hoe.

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A more fundamental distinction between primitive and advanced agriculture may be made in terms of land use rather than of tools. Primitive cultivators, with the possible exception of those living in arid regions, raise one or two crops on a given plot of land, then abandon the plot and make a new field, preferably in the forest, so that the old plot lies fallow sometimes for many years and may itself revert to forest; in short, primitive cultivators shift the place of their agricultural activities with regularity. The crop land consists of small patches scattered throughout the forest; these patches are extremely ragged in appearance and do not look at all like fields. A primitive cultivator would never think of removing stumps and fallen trees; instead, he deliberately raises his crop among them. This kind of cultivation is best described as shifting-field, or shift-

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[9] Hahn: Das Alter der wirtschaftlichen Kultur, 1905; idem: Die Entstehung der Pflugkultur, 1909; idem: Von der Hacke zum Pflug, 1914; Kolff: "Hahn's hypothese," 1926, pp. 884–907.

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ing, cultivation. In contrast to this method, advanced agriculture is practiced year after year on the same well tended plot, the fertility of which is maintained by manuring, crop rotation, intensive cultivation, terracing, and often the regular addition of mineral matter in the form of silt deposited on the land by irrigation water. Only occasionally may the land be allowed a short fallow period. This type of tillage may be called permament-field, or sedentary, cultivation.[10]

Shifting cultivation and sedentary cultivation are generic terms used to describe fundamental differences in land use, differences that find their outward expression in the cultural landscape created by those who maintain these economies.[11] Can there be a greater contrast than that between the shifting cultivators' small, irregular, temporary clearings with their chaotic jumble of fallen and half-fallen tree trunks and stumps, on the one hand, and, on the other, an irrigated plain, subdivided into small fields, each surrounded by a dyke—or a steep slope where a succession of beautifully built terraces leads up for several hundreds or even thousands of feet? These kinds of landscape are physical expressions of totally different economies, or modes of life, with different cultural patterns, concepts of land tenure, attitudes toward the soil, and material equipment.

Historically, shifting cultivation without doubt antedates sedentary cultivation, which requires among other things more elaborate techniques and deeper insight into the relationships between soil, tillage, and yields.

Shifting and sedentary cultivation may each be further classified in terms of tools, as we have seen, or in terms of crops, systems of rotation, and the like.[12] For instance, in terms of crops, we may distinguish between grain and grainless culture. Of the two, grainless culture is generally conceded to be the older. One argument for this thesis is that fruits and many of the root and leaf crops may be eaten raw or simply prepared, whereas cereals require more elaborate preparation. The fact that grainless agriculture is largely confined to the fringes of Southeastern Asia also supports the thesis that, at least in this region, grainless agriculture preceded the cultivation of cereals. Still further substantiation is found in Polynesia, where the inhabitants cultivated no cereals when they were first visited

[10] Although sedentary cultivation is commonly practiced by people who use plows drawn by animals, there are large areas where it is practiced with little or no use of the plow. Such areas are found in parts of the Philippines, Java, Sumatra, and southern China, where steep hillsides have been terraced and where the nature of the terrain makes the use of work animals impossible. Sometimes individual farms or patches of land are so small that they must be tilled with hoes, even though plows may be used on adjacent farms. In places custom and religious tradition forbid the use of plows and draft animals.

[11] Waibel: Probleme der Landwirtschaftsgeographie, 1933, p. 11.

[12] For example, we may distinguish: (a) shifting dibble cultivation, shifting hoe cultivation, and shifting plow cultivation; (b) grainless shifting cultivation and shifting grain cultivation; (c) shifting field-forest cultivation and shifting field-grass cultivation; (d) permanent plow cultivation and permanent planting-stick cultivation; (e) permanent four-field cultivation, and so on. Not all of these are found in Southeastern Asia.

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by Westerners. This may be explained by the assumption that the ancestors of the Polynesians migrated from Southeastern Asia to the islands of the Pacific before cereals had replaced root crops as dominant plants.[13]

In Southeastern Asia we find both shifting and sedentary cultivators who depend exclusively upon root crops as a source of starch. The Nias, Mentawei, and Engano islanders off the western coast of Sumatra grew no grains until recently. Beside such root crops as taro (*Colocasia esculenta* Schott), yams (*Dioscorea* sp.), and *bira* (*Alocasia macrorhiza* (L.) Schott), they cultivated such other foods as bananas (*Musa sapientum* L.), sugar cane (*Saccharum officinarum* L.), and coconuts (*Cocos nucifera* L.). In the eastern parts of the Malay Archipelago and New Guinea the inhabitants depend chiefly on the starch of the sago palm (*Metroxylon sagu* Rottb.) which they either plant or collect in the wild state. Here, again, taro, yams, and bira are other sources of starch, as are such imported American plants as cassava (*Manihot utilissima* Pohl) and sweet potatoes (*Ipomoea batatas* Poir.). The folklore and religious practices of many tribes in Borneo and Celebes who today grow cereals recall the time when these tribes had only root crops.

In many parts of the Pacific taro is grown by sedentary cultivators on terraced, flooded fields.[14] We do not know whether the techniques of terracing and irrigation developed independently in Oceania and on the mainland, or whether the ancestors of the Polynesians brought their techniques with them from Southeastern Asia. If the latter be true, they must have left before the cultivation of rice was known to them; otherwise rice would have been among their crops. That it was not among them suggests that

[13] Forde: Habitat, Economy and Society, 1934, pp. 428–430. In remote centuries the Polynesians lived in the Malay Archipelago, where they cultivated such root crops as taro, yams, "arrowroot" (*Canna orientalis* Rosc.), and turmeric (*Curcuma* sp.), in addition to bananas and plantains (*Musa paradisiaca* L.), breadfruit (*Artocarpus communis* Forst.) and coconuts, all of which, according to the botanists, are natives of the forest regions of Southeastern Asia, whether the mainland or the Malayan Archipelago. All these plants were probably carried to Polynesia, either via a northern route through Micronesia or by a more southerly course through New Guinea and Melanesia. See Buck: Vikings of the Sunrise, 1938, pp. 305–309. The names of these plants were also carried into the islands of the Pacific. Variants of the names "taro" and "bira," to mention two examples, range from the Malay Archipelago far into Oceania. *Colocasia* is *talo* in Nias, *tales* in Sundanese, *tales* in Javanese, *dalo* in Fiji, *talo* in Samoan, *kalo* in Hawaiian, *taro* in Maori. *Alocasia* is known as *birah* or *bira* in Batak, *bira* in Madurese, *biga* in the Philippines, *piga* in Guam, and *via* in Fiji. Later, the Polynesians, following the example of other peoples of the Pacific, were quick to adopt such New World crops as cassava and sweet potatoes as well as American fruit trees into their economy because these are closely related to their customary crops, but they still remain most reluctant to change from roots to grains as staple, possibly because "the cultivation of roots and fruit trees has little technical relation to the raising of grains, for they are not grown from seed but from eyes and cuttings." See Forde: *op. cit.*, p. 380. Another illustration of the fact that a plant, the introduction of which involves a change in methods of cultivation, is accepted only under pressure, is found in the history of the introduction of the potato into Europe.

[14] Krämer: "Der Taro und die Nasskultur," 1928, pp. 165–172; Rivers: "Irrigation and the Cultivation of Taro," 1926, pp. 262–287.

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taro had been cultivated on permanent flooded fields earlier than had rice. Another possibility would be that taro, together with the technique of irrigation, was introduced into Oceania later than were the yams and alocasia, and the Polynesians' more important fruit trees.

A folktale of the Bontocs in the mountains of northern Luzon furnishes us with another clue. According to Bontoc lore, their hero, Lumauig, taught them agriculture in a tiny irrigated garden, which is still tended from generation to generation by a special priest. The crop of this garden is taro and not rice.[15] This would seem to lend support not only to the thesis that the cultivation of root crops preceded that of grain but also to the thesis that terracing and irrigation were already being practiced by cultivators of root crops.

A beautiful example of sedentary cultivation with root crops as a staple has recently been discovered in the remote Grand Valley of the Balim River in the highlands of Netherlands New Guinea. On the valley floor of the Balim and its tributaries neolithic people practice intensive cultivation, including such techniques as the use of green and animal manure, deep tillage with stone adzes, the digging of ditches to improve the run-off and drainage of swampy land, and the construction of terraces.[16] On the slopes they practice shifting cultivation. In both their shifting and their sedentary agriculture the staple crop is the sweet potato, while taro is a secondary crop. Also subsidiary are bananas, sugar cane, and pandanus.

In most parts of Southeastern Asia, however, root crops have been replaced by such cereals as millet, Job's tears, upland and lowland rice,[17] and maize. There seem to be good reasons to believe that the first cereals cultivated in Southeastern Asia under the system of shifting cultivation were foxtail, also known as Italian millet (*Setaria italica* Beauv.), and Job's tears (*Coix lacryma-jobi* L.). Before their domestication these grasses, like the root crops and fruit trees of Southeastern Asia, had been used by alithic and palaeolithic hunting and gathering people. Shifting cultivators succeeded in domesticating these plants by selecting over the course of years the species most valuable to them. Although foxtail and Job's tears have largely been replaced by the more valuable grains, rice and maize, there are still shifting cultivators in India, Thailand, Indochina, Malaya, the Indies, and the Philippines who raise the former cereals. Burkill says of foxtail,

> Such a crop as this probably came into cultivation before man had settled enough to grow the better cereals. Its grain ripens in even as little as two months and a half from sowing, and the wandering tribes of the Malay forests are able to remain in one neighbourhood long enough to catch a crop: but the usual duration of the crop seems to be four months.[18]

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15 Keesing and Keesing: Taming Philippine Headhunters, 1934, p. 56.

16 Brass: "Stone Age Agriculture in New Guinea," 1941, pp. 555–569.

17 Upland rice is also known as hill, mountain, dry-land, or dry, rice; lowland rice is also known as irrigated, wet-land, or wet, rice.

18 Burkill: *op. cit.*, Vol. 2, p. 1999.

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part of the government and of missionaries to introduce terracing and wet-rice cultivation but, instead, continue to practice shifting cultivation and to depend upon dry rice as their staple food.

Wherever we find shifting cultivation the density of population is low; on the other hand, permanent cultivation provides the basis for higher densities. The higher the density, the greater is the care bestowed upon the cultivation of the soil. The development of permanent-field cultivation, the construction of terraces on mountainsides and hillsides, the dyking and draining of plains, and other complex techniques associated with wet-rice cultivation are but expressions of a population density that demands an intensive utilization of the soil and a maximum production of food crops.

The areas where wet rice was first cultivated were probably hollows and small valleys and the well watered slopes of low hills rather than the great plains and wide valleys that are today the rice granaries of the world. The utilization of extensive plains and broad river valleys for the cultivation of wet rice requires a social organization unknown to the peoples who first began wet-rice culture.

It is thought that the cultivation of wet rice originated in days when the hoe and the dibble stick were the only agricultural tools, that is, before the animal-drawn plow reached Southeastern Asia. The broadcasting of seeds is held to be characteristic of plow culture, whereas the cultivators of wet rice in Monsoon Asia generally plant their rice seedlings in the manner of shifting cultivators,[29] a circumstance that would seem to support the hypothesis that the carabao and the plow were not a part of the original technique but were adopted later. Even today wet rice is raised in some parts of Southeastern Asia without the use of the plow. For example, peoples in central Celebes prepare their fields for cultivation by driving carabaos back and forth until the fields are thoroughly puddled.[30] In other areas where wet-rice fields are built on such steep slopes that it is impossible to get carabaos to the terraces, farmers are frequently obliged to till their land entirely by hand—employing only such tools as wooden spades and sticks, which may be shod with iron. The Ifugaos of northern Luzon, for example, have terrace walls reaching, in some cases, heights of 60 feet or more that can be scaled only by means of rocks jutting out from the faces of the walls.

Although most sedentary cultivators in Southeastern Asia make use of

[29] Although rice growers in other parts of the world generally use the broadcast method of sowing, one finds it in Southeastern Asia only as a rare exception. According to Copeland (*op. cit.*, p. 224) the *sabog*, or broadcasting method, is used in the Philippines over a rather limited area. This method produces lower yields but its advantages are "some saving of time, saving the labour of transplanting, and the possibility of maturing a crop with less water; rice grown directly in its place can get along with less water than transplanted rice." According to Kruyt ("De To Rongkong in Midden-Celebes," 1920, p. 380), the To Rongkong of central Celebes transplant their wet rice only in exceptional cases but usually broadcast it.

[30] Kruyt: "De To Seko in Midden-Celebes," 1920, p. 409.

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Although most sedentary cultivators in Southeastern Asia make use of the animal-drawn plow, in the densely populated regions the parcelling of land has proceeded so far that many peasants, whose fathers, or ancestors, owned draft animals (carabaos or oxen) and used plows, have farms so diminished in size that they cannot afford to keep draft animals and therefore must till their fields entirely with hand tools. In spite of the fact that they often make very intensive use of their fields, still they are not able to produce enough to meet the modest needs of their families.

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In nearly all instances, however, where the governments concerned have attempted to solve this problem by opening up land suitable for sedentary cultivation to settlers coming from problem areas, the governments have been confronted by the fact that these districts, which might offer outlets for the congested areas, are inhabited by shifting cultivators or in some cases by food gatherers. The danger is then that the proposed migration may infringe upon the rights of the indigenous peoples, whose economy and mode of life, as we have noticed, require considerably more land than those of the incoming settlers, who are accustomed to permanent-field cultivation. It is, therefore, necessary for us to understand the various forms of land use in Southeastern Asia and their peculiar exigencies in order rationally to approach the problems of pioneering in the countries around the South China Sea.

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7/x [See pp. 35ff., category 241 or 116. -- Analyst]

Chapter II

THE SHIFTING CULTIVATOR [p 16]

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The field of the shifting cultivator is known by various local terms. It is called *caiñgin* in the Philippines, *humah* in Java, *ladang* in the Indies as a whole and in Malaya, *taungya* in Burma, *tamrai* in Thailand, and *rây* in Indochina.[1] Practically without exception, it is a clearing in either primeval or second-growth forest. The use of grassland is so unusual that we shall limit the following discussion to shifting cultivation on forest land.

As his name indicates, the shifting cultivator does not use the same piece of land every year; instead, he kills or cuts down at regular intervals —every year, every other year, or every third year—the trees of a small forest patch. He burns as much of the woody growth as is possible or convenient. Among the charred stumps and half-burned tree trunks he plants his favorite crops, be they cereals such as millet, upland rice, or maize; or tubers such as yams or sweet potatoes (Figs. 4–10). The latter are planted extensively by the *caiñgero*, the shifting cultivator in the Philippines. In planting cereals it is usually the men who take the planting stick to make little holes and the women who drop in a few seeds, using their feet to cover the seed with soil (Figs. 11–13). As forest land is generally free from weeds or grasses and the soil is usually rich in humus and well supplied with the ash of burned plant matter after clearing, it produces a very good, or even excellent, first harvest; the second harvest begins to show a decline in yield, and thereafter the returns diminish rapidly.[2] Grasses and weeds invade the clearing. Rather than battle these, the peasant abandons his old ladang and cuts and burns a new patch of forest (Fig. 15). The old plot reverts, under favorable conditions, to second-growth forest, the so-called *blukar* of the Malays, and is not cleared again for a period, the length of which may vary from 8 to 15 years, or more.

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Shifting cultivation is characterized by a lack of tillage; the soil is hardly disturbed, as no plow turns it. There is less labor involved than in other methods of cultivation, and the work is more evenly spread over the year—an advantage where labor is relatively scarce. The tasks involved are cutting, burning, and planting; sometimes simple fencing of the field against animals, guarding—especially before the harvest and usually by women and children—and, finally, harvesting. In addition, there may be some weeding in the first year and certainly during the second.

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1 In British India *jhum*, *kumri*, *dhya*, *bewar*, or *dullee*; in Ceylon *chena*; in Japan, Korea, and Formosa *karen* (a Japanese term); in Central America *milpa*; in parts of Africa *chitemene*.

2 Danhof reports for parts of the Lampoeng Districts that a ladang will produce from 15 to 25 quintals of rice in the first year and approximately 5 in the second year. In areas where the second yield shows such a serious decline the peasants usually prefer to make a new ladang—Danhof: "Bijdrage," 1940, p. 199.

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1 [See pp 37 ff., category 241 or 116.--
Analyst]

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Shifting cultivation, the most primitive type of agriculture, may be briefly defined as an economy of which the main characteristics are rotation of fields rather than of crops; clearing by means of fire; absence of draft animals and of manuring; use of human labor only; employment of the dibble stick or hoe; short periods of soil occupancy alternating with long fallow periods. Other terms for shifting cultivation are field-forest economy and field-forest rotation.

Shifting cultivators prefer flat land, but in Formosa, the Philippines, Indochina, and Thailand they have been forced back into the hills and mountains and must often be content with fields on steep slopes (Figs. 16, 17). This has led some observers to believe that shifting cultivation is exclusively practiced in hilly or mountainous regions, or that such regions are preferred in this economy. However, in the Outer Islands[3] of the Netherlands Indies, one frequently finds ladangs in flat country (Fig. 18). If the ladang is very steep it is rarely used for more than one crop, so that new clearings must be made every year.

Many shifting cultivators no longer change their dwellings when they turn to new land; they have become sedentary at least as far as their houses are concerned. They may build a hut in the ladang if it is too far away from their village and may occasionally live in such a shelter, especially at the time when the ripening crop has to be guarded against animals, but they will return with the harvest to their permanent houses in the village (Figs. 10, 19–21).

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Ladang culture, as is frequently true of any form of agriculture, is intricately interwoven with religion. Magic practices and sacrificial offerings must accompany every step in the culture, even if the people are no longer pagans but, for example, Mohammedans. Friedericy has made a careful study of these magical-religious customs in the Ponre mountains at the head of the Gulf of Bone in southern Celebes.[4] In this region the people live in small permanent villages. Whenever they are in need of new ladangs—every second year—the heads of the families meet to choose new locations. At this stage they try to find out from the spirits if these agree to the clearing of the land that was selected. For this purpose the village headman (*dukun*), or somebody else who is familiar with magic, is sent out to the part of the forest that has been chosen. Here the delegate places betel leaves (*Piper betle* L.), each with a small slab of lime and a piece of areca nut (*Areca catechu* L.), under a tree and expresses the desire of his community to cut the trees and to use the soil. He ends with the wish that the betel leaves and the areca nuts be scattered should the choice

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[3] I have used the term "Outer Islands" to denote all the islands of the Netherlands Indies not comprised in the jurisdiction of Java and Madura (Madoera). The Dutch administrative term is *Buitengewesten*.

[4] Friedericy: "Ponre," 1932, pp. 1–34; idem: "De taak van het bestuur," 1937, pp. 488–501. For an excellent description of the magical-religious rites that are associated with the agricultural efforts of the Bemba of Northern Rhodesia, see Richards: Land, Labour and Diet in Northern Rhodesia, 1939, pp. 351–380.

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of the new ladang be a poor one. After three days the same person returns, and if he finds that the offerings have been scattered a new location is chosen and a new attempt is made to get a favorable answer from the spirits. In case the betel leaves have been found undisturbed, all male members of the village have a meal on the chosen land. Then the area is divided among the villagers by the headman. Each individual appeals to the spirits by placing a betel leaf with lime and areca nut on the ladang that has been turned over to him. If the answer is unfavorable he tries again. The betel leaf may be placed three times. If the offering is disturbed each time, the headman turns over a part of his share, which is considerably larger than any of the others, to the less fortunate villager. Throughout the following agricultural year with its stages of clearing, planting, and harvesting, the peasant repeatedly requires the services of the dukun, or *shaman*, as well as the betel leaf.

In other regions details differ, but the essential fact remains that the social-religious life and thinking of the shifting cultivator is bound up with his characteristic form of cultivation.

Shifting cultivators have no concept of private land ownership. The land belongs to the community, the tribe, or the village, and each member has the right to use as much land as he needs and can cultivate. The location of the land that he is to use may be decided upon by the village council or the headman. The person who clears the land and plants the crop gets the produce. Nobody has the right to plant a plot that has been cleared by someone else. As soon as the land is abandoned all rights are forfeited, except the right of the community. However, if trees have been planted, the ownership of the trees and their produce remains with the person who planted them, and he is given preference when the land has had a sufficient fallow period and can again be cultivated.

The Effect of Shifting Cultivation on the Land

As has been stated above, ladangs decline in fertility after the first crop, and obnoxious grasses and weeds appear among the stooling tree stumps. As long as there is an abundance of forest land at his disposal the cultivator prefers to abandon the ladang. Under favorable conditions the grasses will, in turn, give way to second-growth forest. In the course of centuries this second-growth forest may develop into a climax forest, that is, a forest having the same composition as the primeval forest. In any case, when tall forest growth again occurs, the land will have had time to recover its original fertility.

Unfortunately, however, conditions are often not sufficiently favorable for a regeneration of soil fertility and the development of a good second-growth forest. As a matter of fact, the practice of shifting cultivation has altered the character of vegetation beyond recognition over wide areas in Southeastern Asia. Instead of a dense primeval rain-forest, we now find

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extensive open grasslands resulting from the most important tool of the shifting cultivator, fire.

Generally, the fallow period allows time only for the evolution of mediocre second-growth forest, for the shifting cultivator usually returns to an old ladang before even a small percentage of those tree species that made up the original stand have had a chance to come back. Repeated cultivations further impoverish the forest and reduce the number of species. Certain light-loving trees that played a minor role in the climax forest will spread rapidly and dominate, together with those species that show a resistance to fire and those that are capable of sending new sprouts out of the old stumps.[5]

If fire repeatedly invades an abandoned ladang, the tree flora is reduced until finally only grasses and herbs survive. These persist because their root systems, tubers, or bulbs send out new shoots after the fire. The more important grasses and herbs that finally triumph over forest vegetation are *Imperata cylindrica* Beauv., *Imperata constricta* Hitchc., *Saccharum spontaneum* L., *Themeda gigantea* Hack, and *Eupatorium odoratum* L. These burn very rapidly and with a hot flame, even when still green. After they are well established they catch fire or are set afire every year, almost without exception; this prevents natural reforestation. Furthermore, the fire will also invade the neighboring forest and force it gradually back, so that the grass area steadily increases. This is especially true in hilly or mountainous country. In the Philippines about 18 per cent of the total area is covered with grass vegetation as a result of shifting cultivation and fires. These grass areas are known locally as *cogonales*. In the Indies, where they are called *alang-alang*,[6] they are also extensive, as in southern Sumatra. While I was traveling through southern Sumatra by rail during the dry season I counted twenty grass fires started within the space of an hour by sparks from our locomotive. In Thailand there is as yet very little cogonal land, according to Pendleton.[7] In Indochina culturally induced grasslands, either pure or with scattered trees—the latter called by the French *forêts claires* or *savanes-parcs*—are very extensive[8] (Figs. 23, 24).

Once the vegetation of an area has been changed from forest to grass, the land is of no more agricultural use to the shifting cultivator. The only benefit that he then gets out of the land is for hunting. For this, too, he often utilizes fire—either to drive wild animals out of hiding or to get a growth of young grass to attract his prey.

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[5] In Malaya and Sumatra the spread of such bushes and trees as *Lantana camara* L., *Schima bancana* Miq., *Peronema canescens* Jack, *Vitex pubescens* Vahl, *Melastoma malabathricum* L., and *Lagerstroemia speciosa* Pers. is due to the cutting of clearings.

[6] *Imperata* (both *constricta* and *cylindrica*) is known in the Philippines by the Spanish term *cogon*, in the East Indies as *alang-alang*, and in Malaya as *lalang*. The last two are Malay words.

[7] Pendleton: "Some Interrelations between Agriculture and Forestry," 1939, p. 41.

[8] Gourou: L'utilisation du sol, 1940, pp. 368–372.

[See p. 38, cat. 241 or 116 -- Analyst]

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When fires no longer ravage the grasslands, however, trees return and finally drive out the grasses completely, for the latter cannot stand shade.[9] The spread of grass is especially rapid in regions with a long, pronounced dry season, whereas reforestation is more likely to take place in areas with a well distributed, high annual rainfall. This may explain why the Philippines and Indochina have a larger percentage of open grasslands than do Malaya and the Netherlands Indies.

A relatively high density of population is an important factor in preventing successful reforestation and encouraging grasses. In a thinly settled forest area there is sufficient land to allow for a long rest period, but an increasing density of population results in the shortening of the fallow period to such a degree that the soil is given insufficient time to recover its fertility. The shorter the fallow period the poorer the succeeding forest —if any—and the poorer the following crop yields, until finally the land can no longer satisfy the needs of the shifting cultivator.

Pendleton believes that this cycle may have contributed materially to the downfall of the Khmers in Cambodia (Cambodge). He states that although the Khmers used the plow on very limited areas of wet riceland, they had largely to depend on the planting stick and shifting cultivation for their food supply. As the demands for more food arose from the rapidly increasing population concentrated in the city of Angkor, the fallow period granted to the uplands had to be progressively shortened. At the same time fires became so frequent that culturally induced grasslands spread while the cultivable area decreased, thus further diminishing the food supply available to the people of Angkor. "While the actual fall of Angkor is ascribed to the superior military power of invaders, the resistance of the inhabitants was doubtless much less than it would have been had the lands been productive and they had had adequate supplies of food."[10]

Declining crop yields and the spread of grasses have been advanced as important reasons for the breakdown of the Mayan civilization,[11] and Pendleton further raises the question "whether the development of cogonals might not have been an important contributing factor in the dying out of some of the other civilizations of the tropics, notably that of Anuradapura, in Ceylon."[12]

Today the ruins of the Mayan cities, as well as those of Angkor, are surrounded by relatively luxuriant forest vegetation, which has had time to displace the pernicious grasses since man and his tool, fire, have abandoned the inhospitable grasslands.

Not only does shifting cultivation alter the character of the vegetation,

[9] When an old ladang remains unburned for several years the following trees spring up in addition to those already mentioned in footnote 5: *Erechthites hieracifolia* Rafin., *Blumea balsamifera* DC., *Peltophorum dasyrachis* Kurz, *Macaranga tanarius* Muell. Arg., and *Piper aduncum* L.

[10] Pendleton: *op. cit.*, pp. 46 and 47.

[11] Cook: "Milpa Agriculture," 1921, pp. 307–326.

[12] Pendleton: *op. cit.*, p. 47.

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Not only does shifting cultivation alter the character of the vegetation, but also it may induce soil erosion, especially when it is practiced on slopes. Forest vegetation keeps the soil from being washed or blown away, but at the end of the dry season, when the trees have been cut and burned, the soil lies exposed. Consequently, during the early days of the rainy season large quantities of topsoil are washed downhill and carried by rivers to the plains. Erosion, by lowering the moisture-holding capacity of the soil as well as the rate of absorption, may thus cause further acceleration of run-off and lead finally to destructive floods on the plains. Such floods are frequent in the Philippines and parts of the East Indies. Pendleton points out that in Thailand the main rivers receive their great load of silt from the more steeply sloping mountains of northern Thailand where shifting cultivators have started the forces of accelerated erosion.[13]

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The large quantities of valuable timber destroyed year after year by the shifting cultivators in virgin areas and the prevention of reforestation by the fires that spread through the abandoned fields (Fig. 22) cause the forester to regard the shifting cultivator as his enemy. In the Philippines the forester has for many years been pleading for strictly enforced laws and severe penalties against shifting cultivators.

> The greatest enemy of our forest is caiñgin making. It is to the persistent practice of this crude form of agriculture from time immemorial that the existence of vast areas of denuded waste lands is attributable. Much of our valuable timber has been and is still being wasted by this illegal form of forest clearing. There are actually over five and a half million hectares of open lands that are practically idle. Due to continued caiñgins and the recurrence of fires on these open lands, the forest area is decreasing year after year. . . . Destructive floods in various parts of the Islands and the yearly appearance . . . of locust pest, the extermination of which is costing the Government hundreds of thousands of pesos yearly, are chiefly the direct results of this obnoxious practice.[14]

Conflicting Views on the Merits of Shifting Cultivation

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Judgments on the merits of shifting cultivation have been rather contradictory since the practice first came to the attention of scientific observers. During the past century the Dutch in Java spoke of it as *Raubbau* (robber economy), and one still finds the expression used. Sauer protests against this term. According to him, shifting cultivation is a "primitive economy, in which the per capita area of land needed for a community is rather large and in which the forest growth is to be considered as a part of a long term rotation of fields." He is of the opinion that it is "an excellent device for maintaining permanent productivity."[15]

Lord Hailey calls shifting cultivation "less a device of barbarism than a concession to the character of a soil which needs long periods for recovery and regeneration; and the trekking habit, whether of Dutch farmers

[13] Pendleton: "Soil Erosion in the Tropics," 1940, p. 757.
[14] Letter of the Director of the Bureau of Forestry to the Secretary of Justice, September 10, 1934.
[15] Sauer: "Destructive Exploitation," 1938, p. 406.

[See p. 38, cat. 241 or 116 — Analyst]

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[in South Africa] or African tribes, has been due to the requirements of that 'extensive' system of occupation which the character of the soil has seemed to demand."[16] But he knows from his African experiences that shifting cultivation has there reached the point where it has become the source of problems that tax the ability of the colonial administrator. "The problems which arise today are mainly due to the changes forced on this system by the restriction of land, the stabilization of populations . . . and the extension of cultivation in order to produce crops for sale."[17] He considers shifting cultivation, or *chitemene* as it is called in parts of Africa, "most wasteful, but, as experience has taught the African that burnt forest land is particularly suited to the staple crop of small millets, it is practised throughout the forest areas of Africa, and in some areas all high forest has already disappeared."[18] Worthington thinks that "shifting cultivation is admirably adapted to the needs of primitive peoples, provided there is sufficient land available"; but he also states that "after a long period of shifting cultivation the whole character of the vegetation may be altered beyond recognition. In countries with an equatorial climate, without a dry season, shifting cultivation usually changes virgin forest into secondary forest and thence to a kind of bush vegetation."[19]

The growth of population and the change from a subsistence to a money economy have increased the land requirements of the African hoe-culture peasant to such an extent that shifting cultivation has led to large-scale deforestation and has brought soil erosion, which today is recognized as one of the main problems of agriculture, in its wake. Deforestation and soil erosion have forced the colonial administrators of Africa to study shifting cultivation carefully in an attempt to find a solution to the problem. The Council of the Royal African Society passed the following resolution on October 20, 1937:

> That this Council views with the gravest concern the widespread destruction of the African soil by erosion consequent on wasteful methods of husbandry [shifting cultivation] which strike at the basis of rural economy and Native welfare, and is of opinion that immediate steps should be taken for the adoption of a common policy and energetic measures throughout British Africa in order to put an effective check upon this growing menace to the fertility of the land and to the health of its inhabitants.[20]

Shifting cultivation has been practiced on hilly land for countless centuries in India, where examples are found in Bengal and Assam, and in the northern parts of Burma; but because of disease and feuds, there was

16 Hailey: An African Survey, 1938, p. 1. We refer especially to shifting cultivation in Africa because there it has attracted much more attention than in Southeastern Asia. In the greater part of Africa it is the only form of agriculture, whereas in Southeastern Asia it takes a minor position.

17 *Ibid.*, p. 879.

18 *Ibid.*, pp. 879–880.

19 Worthington: Science in Africa, 1938, pp. 376–377.

20 Land Usage and Soil Erosion in Africa, 1938, p. 3.

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always sufficient land for the population without undue pressure on the forests. A result of British rule has been to increase the population and correspondingly to reduce the rest period of the soil. The consequences have been deforestation and soil erosion. For that reason the authorities have attempted to stop this mode of land use.

In Java shifting cultivation attracted the attention of the government as early as the beginning of the nineteenth century. It was practiced especially in the mountains. The fact that a shifting cultivator required more land than a peasant who cultivated the same piece of land year after year made shifting cultivation extremely undesirable to a colonial administration that wanted to use all available land for the production of cash crops—either under the "forced culture system" of 1830 to 1870[21] or under the private plantation system that has existed since 1870. This circumstance, together with an alarming increase in population, prompted the government to do everything possible to stop the practice of shifting cultivation in Java, and today it is found only in the quite thinly settled residency of Bantam in West Java.[22] In the Outer Islands, with their sparse population and large forest areas, it is widely practiced. But, in contrast to their predecessors, Dutch officials of recent times rarely use the term *Raubbau* for shifting cultivation. Instead they consider this form of land use justifiable if the abandoned fields revert to forest and have the possibility of regaining their former fertility. In the past fifteen years, however, warning voices have pointed out that in large parts of the Outer Islands ladang culture has become a source of destruction, for the forest is no longer being given an opportunity to recuperate.[23] Both agricultural and forestry officials have consequently become concerned over shifting cultivation. In 1930 Hagreis presented a paper on ladang culture before the congress of officials of the Agricultural Advisory Service in the Netherlands Indies.[24] At that time it was decided to appoint a special commission to study ladang culture.[25] The foresters, also, devoted a good deal of attention to the problem during their congress in 1937. In 1940 Van Beukering of the Department of Economic Affairs summarized the result of the ladang *enquête*.[26] He came to the conclusion that shifting cultivation is a logical and economically justifiable form of land use wherever there is a large amount of land available and a primitive economy exists. From a social point of view no objection can be raised if, after each occupation, the fertility of the soil is regained. There is no reason to insist upon more intensive forms of land use so long as the population density does not increase beyond 50 persons per square kilometer, or 130 persons per square mile. If at this density we

21 From 1830 to 1870 the peasants of Java were forced, under the notorious "culture system," to devote part of their land and labor to producing crops for the government.
22 Kools: Hoeman's, 1935.
23 Gonggrijp: "Soil Management," 1938, pp. 397–404.
24 Hagreis: "Ladangbouw," 1930, pp. 43–75 and 629–642.
25 "Enquête betreffende het ladangvraagstuk," 1931, pp. 1022–1033.
26 Van Beukering: Het ladangvraagstuk. Unpublished typescript, 1940.

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allow for five persons per family and assume that the family shifts its cultivation plot annually but returns to the same plot after an average period of 10 years, each family could occupy annually one hectare, or 2.47 acres. This is the amount of land that an average shifting cultivator in the Indies needs in order to cover the food requirements of his family.

This calculation does not make any allowance for permanent forests. Actually, however, the land requirements are not quite so high, because very often the same land is used for two years instead of one, which would either allow for a longer period of fallow or keep a part of the virgin forest intact. The latter is improbable because of the shifting cultivator's preference for virgin forest.

To summarize these opinions, shifting cultivation from the agricultural point of view is not considered objectionable so long as vegetation and the fertility of the soil are restored by nature. The opinion of those who regard it as a fatal agricultural system under all circumstances is widely felt to be unjustified. From the silvicultural point of view, shifting cultivation is held to be objectionable if it destroys timber that would otherwise be exploited by the forest service or by private concessionaries.

Supplementing Shifting Cultivation With Cash Crops in the Netherlands Indies

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The products of the typical shifting cultivator never reach a distant market. There is seldom any surplus, for the shifting cultivator is a subsistence farmer who lives from hand to mouth. In the Outer Islands of the Netherlands Indies, however, the shifting cultivator has been drawn into modern economy and has modified this age-old system. In parts of Sumatra and Borneo he has begun to diversify his economy by planting tree crops on the ladang among his rice or maize. After one or two harvests the fields are abandoned and left to the trees that have been planted. The trees then furnish an additional source of income as soon as they reach the bearing stage. Pepper has been raised as a ladang crop for many centuries, especially in the Lampoeng Districts. Coffee was introduced in the days of the Dutch East India Company and adopted as a commercial crop by the peasants. Benzoin (*Styrax benzoin* Dryander), also, has long been grown in this manner. More recently coconuts and, since about 1905, rubber have become ladang crops (Figs. 25–33).[1]

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A shifting cultivator may, over a period of years, convert his old ladangs into rubber gardens, for example, until he is assured of a sufficient income from his permanent tree crop to buy his food from the outside and no longer requires a ladang for the production of food. This process has led to the creation of the large native rubber areas in Borneo and Sumatra, where some shifting cultivators have become dependent upon the market price of rubber and upon the policy of the government in regard to taxation and export control. In times of low prices and export restrictions they may suffer severe economic setbacks and even hardship. In Bengkalis

[1 See p. 39 ff, cat. 241 or 116 -- Analysis]

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The Areal Extent of Shifting Cultivation in Southeastern Asia

It is difficult to form an idea of the areal extent of shifting cultivation because of its migratory nature and the fact that it is often practiced in remote regions. The only country of Southeastern Asia in which an attempt has been made to estimate the area used for shifting cultivation is the Netherlands Indies, but even there it was not possible to include all

Table II—Philippine Islands: Illegal Caiñgins Detected, 1914-1940

Year	Illegal caiñgins	
	Number	Area in hectares
1914	895	....
1915	1 198	....
1916	845	....
1917	665	....
1918	776	....
1919	603	....
1920	721	....
1921	1 602	1 429.48
1922	3 110	2 803.55
1923	1 759	1 516.33
1924	1 753	1 396.90
1925	1 762	1 391.29
1926	1 829	1 476.61
1927	2 002	1 743.92
1928	1 774	1 602.95
1929	1 312	1 370.41
1930	3 227	3 279.77
1931	2 534	3 345.74
1932	2 547	5 586.27
1933	2 427	2 831.38
1934	3 207	3 215.46
1935	2 631	2 455.73
1936	2 314	2 510.59
1937	1 967	2 308.24
1938	1 766	2 029.68
1939*	906	1 331.12
1940†	2 646	4 416.56
Total	48 778	48 071.98

Source: Data supplied by the Bureau of Forestry, Manila.
*Six months only, ending June 30, 1939, because of change of fiscal year.
†From July 1, 1939, to June 30, 1940.

parts of the Outer Islands in the estimate. Van Beukering concluded that one-third of all food consumed in the Outer Islands was grown on ladangs; this would require a total of 1,100,000 hectares of land. If we assume that all ladangs are occupied for 2 years and lie fallow for 12 years, the shifting cultivation system would need seven times 1,100,000, or 7,700,000, hectares. This estimate does not include the ladang area under coffee and pepper cultivation. (Rubber, coconut, and benzoin cannot be considered because they are, for practical purposes, permanent crops.)

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1/ [See p. 26, category 241 or 116. -- Analyst]

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Van Beukering allowed an additional 200,000 hectares for coffee and pepper ladangs; so that the total area amounts to about 8,000,000 hectares. If we assume that the population of the Outer Islands increases at the rate of 1½ to 2½ per cent each year, it would double in from 29 to 47 years. This would mean that after about 30 to 50 years 16,000,000 hectares would come within the scope of shifting cultivation.

In Malaya ladang cultivation is illegal, but it is practiced in the hinterland well away from roads and railways, in eastern sections of the peninsula. Dobby recently described it in Pahang and northeastern Kedah, near the Thai border.[20] The Sakai of Pahang regularly abandon their primitive huts as well as the clearings when they shift to a new field (Map, Fig. 2).1/ The Malays of northeastern Kedah, on the other hand, as a rule live permanently in one place and change only their fields (Map, Fig. 3).1/ There are no statistics available on the areal extent to which shifting cultivation is carried on in Malaya, but according to Dobby the system gives way to permanent culture "as the standard of cultivation rises and as the effect of law becomes stronger."[21]

In Thailand shifting cultivation is extensively practiced by the tribes of the mountains of the north and west, on the eastern part of the Khorat Plateau, and on the peninsula. Probably about 1,000,000 people depend upon it. According to the same kind of calculation that Van Beukering made for the Indies, a total of 1,400,000 hectares would be required, or 200,000 hectares annually, if we allow five persons per household and consider that one hectare covers the needs of a family for 2 years.[22]

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In Indochina only the tribes of the mountains of Tongking, Laos, and Annam now practice rây, or shifting, cultivation. The people of the plains, Annamese and Cambodians, who represent 84 per cent of the population, practice a more intensive form of agriculture. Gourou has estimated the areal extent of shifting cultivation in Indochina. He states that a rây is used for 2 years and has to lie fallow for at least 20 years, which seems a rather long period as compared with other countries. In addition to its extensive plains, Indochina has a mountainous or hilly area of 580,000 square kilometers. Only one per cent of this land is permanently cultivated. Gourou estimates that about 40 per cent of the mountainous country is suitable for rây cultivation and he assumes that one-tenth of this, or 4 per cent of the total mountain land, is under rây cultivation in any one year.[23] If this calculation is correct it would mean that 23,200 square kilometers, or 2,320,000 hectares, are occupied annually by shifting cultivators. The numerical strength of the shifting tribes shows, however, that this estimate cannot be correct. Their number is not much greater than

[20] Dobby: "Settlement Patterns in Malaya," 1942, p. 222.
[21] *Ibid.*
[22] For an excellent description of the life of the shifting cultivators in Thailand, see Credner: Siam, 1935, pp. 148–173.
[23] Gourou: L'utilisation du sol, 1940, pp. 177–182, especially pp. 180 and 182.

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[See p. 27, category 116. -- Analyst]

1,500,000, or at the most 2,000,000, which would mean about 300,000 to 400,000 households. This number of households could hardly occupy such a large rây area as Gourou assumes.

In Formosa only the Malay tribes of the mountains in the eastern half of the island practice shifting cultivation. They number, according to estimates, about 150,000. From this we may assume that not more than 30,000 to 50,000 hectares are occupied annually by shifting cultivators.

In the Philippines it is unlawful to make caiñgins on public land without the permission of the Bureau of Forestry.[34] Permission will be given if the forest on the land involved is of no commercial value and if the caiñgero accepts the obligation to reforest his patch with seeds supplied by the forest service. Several hundred caiñgeros are brought annually before the justices of the peace, who in the past, because their sympathy was with the caiñgeros, were usually rather reluctant to fine the culprits (Table II). Nobody knows, of course, how many illegal caiñgins escape detection, but it is certain that they greatly outnumber those that are made with the permission of the foresters added to those that have been brought to the attention of the courts. Special consideration is given to the "non-Christian" tribes, for whom tracts of land have been set aside within which they continue their age-old system of cultivation. In Mindanao probably three-fourths of the population, from the primitive Manobos to the more advanced Moros, practice the caiñgin system of cultivation. Other regions where this system is practiced extensively are Mindoro, Cebu, southern Negros, and parts of Luzon—the central and eastern cordillera and the Camarines. About 10 per cent of the population of the Philippines obtain a part or all of their food from caiñgins, most of which are made either on private land or on land that belongs to non-Christian tribes who know no other form of agriculture.

Methods of Eliminating the Undesirable Aspects of Shifting Cultivation

In regions where the density of population exceeds 50 persons per square kilometer, shifting cultivation becomes wasteful and destructive. It is imperative in such areas that the system be either modified or else replaced by more conserving and, where possible, more intensive forms of land use. For most backward tribes this involves fundamental changes in their mode of life, religious ideas, and concepts of land rights.

In some instances it should suffice to adopt measures that eliminate the harmful or wasteful after effects of the system without requiring that this kind of land use be given up completely. Let us assume that we have a somewhat thinly settled region containing a forest that is not particularly valuable and the exploitation of which is impracticable or at present inexpedient. Deforestation and the spread of grasses are undesirable aspects

[34] Nano: "Kaiñgin Laws," 1939, pp. 87–92.

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of shifting cultivation in the area. In such a case reforestation would be assured by keeping fire out of the old clearings. This could be done by leaving relatively non-inflammable forest belts at least 60 feet wide between individual clearings. These forest belts would offer some protection against the spread of grass fires and at the same time would be a source of seed for further reforestation. Reforestation under such circumstances would be much easier and cheaper than if large contiguous areas were to be cleared and used.

Where natural reforestation is particularly slow, cultivators should be required to practice artificial reforestation. In scattered regions in Southeastern Asia tribesmen do this on their own initiative. Pendleton reports such a case in Burma.[35] Certain Dyak tribes in Borneo plant seeds of the candlenut tree (*Aleurites moluccana* Willd.) about 3 meters apart in a freshly cleared ladang before it has even been burned. In the eastern part of the Malay Archipelago shifting cultivators plant such trees as *Aleurites moluccana* Willd., *Erythrina lithosperma* Miq., *Albizzia falcata* Backer, *Hibiscus similis* Bl., *Casuarina equisetifolia* L., *Macaranga* species, *Euphorbia* species, *Sesbania grandiflora* Pers., and *Desmodium timoriense* DC. for the purpose of restoring the forest.

In Sumatra Deli tobacco planters initiated artificial reforestation after alang-alang had regularly invaded their fallow fields and caught fire so frequently that second-growth forest could not get a start. In Deli the tobacco fields are in use only 1 year and lie fallow 7 to 10 years. They should be protected by forest growth during that period. Therefore, in order to make this possible, the planters controlled fires by planting belts of teak along the highways and roads. These belts served as fireguards and at the same time provided lumber for tobacco-drying sheds. On the tobacco fields themselves they planted especially *Albizzia falcata* Backer, *Cassia siamea* Lam., *Pithecellobium saman* Benth., and *Leucaena glauca* Benth., which drive out the alang-alang[36] (Figs. 34–39).

Another way of speeding up reforestation is to spare a few of the larger trees at the time of the clearing. This is done by the Malays of Sumatra. They do not cut down *Koompassia parvifolia* Prain, *Arenga saccharifera* Labill., *Durio zibethinus* Murr. (durian), *Parkia* species, or *Garcinia grandifolia* Pierre.[37] The last three are fruit trees that are numerous in the forest, whereas the second is a palm whose flower stalk is tapped for its sugary sap and the first is preferred by bees as a hiving tree, which gives it its name, "bee-tree." This tree is preserved because the people want the honey. Worthington reports that in Africa "some tribes appear to realize the necessity of maintaining tree growth on their clearings and merely top the trees and lop the branches, so that the trees are enabled to

[35] Similar cases are known in the residency of Benkoelen in Sumatra, in central Celebes, and in Flores. See Hagreis: "Ladangbouw," 1930, p. 631.

[36] Jochems: "De begroeiing der tabakslanden," n.d., pp. 77–89.

[37] *Ibid.*, pp. 30–32.

[See p 40 ff, cat 116 --Analyst]

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estation is not a discovery of Western-trained scientists but has long been practiced by certain groups in Southeastern Asia. It was the plan of the government to spread and enforce this practice of artificial reforestation wherever advisable. This practice, whereby the cultivator determines the vegetative cover during the fallow period instead of abandoning the ladang to chance growth, brings him to a transition stage between shifting cultivation and permanent cultivation. From there the step to permanent cultivation with crop rotation is but a short one.

Permanent cultivation requires repeated tilling and therefore more labor and tools than the shifting cultivator is accustomed to. Work animals are also desirable. An important obstacle to intensification of agriculture in wide areas of Southeastern Asia, however, is the fact that hill and mountain regions [up to about 1500 meters in elevation] are frequently infested with malaria so that the energy of the people is greatly reduced.[45] Moreover, the acquisition of such implements as plows, harrows, and hoes, and especially of work animals, calls for financial resources or credit, both of which the average shifting cultivator lacks. Some shifting cultivators do own livestock, such as cattle or carabaos, but utilize neither their labor nor their manure. Groups of the Mois in the mountains of Annam have carabaos, but they do not use the animals in their agricultural activities because they "cannot talk" to them.[46] On the Lesser Sunda Islands livestock is kept because it gives social prestige to the owner. Overstocking of the pasture areas on these islands has led to overgrazing and has cut into the forest area until there has developed a scarcity of land suitable for ladang cultivation. The same has happened in large areas in Africa. There it has been necessary to teach the native peasant the use of cattle and make him familiar with the plow. This was done successfully in northern Nigeria by combining the animal husbandry of the nomadic Fulani with the indigenous shifting cultivation of the Hausa peasant, thus developing "a system of permanent farming whereby a man with cattle of his own, say two working oxen and a few cows, can plough and maintain in fertility an area of land sufficient to supply all the requirements of himself and his family, and to obtain a surplus balance as a return for his labour. . . . Thus mixed farming represents a gradual evolution from the shifting methods of cultivation to a static type of agriculture, by the introduction of animal husbandry, and with the use of animal cultivation."[47] Above all, the peasant learns to preserve the animal manure and

a shade tree; *Dolichos lablab* L., a climbing herb which is valuable as a vegetable; *Crotolaria anagyroides* H.B. and K., a bush of vigorous growth which attains a height of from 12 to 14 feet and forms an excellent green manure; *Tephrosia candida* DC. and *Tephrosia vogelii* Hook., low shrubs useful as green manures; and *Mimosa invisa* Mart., a leguminous creeper which suppresses grasses.

[45] Gourou: L'utilisation du sol, 1940, pp. 181 and 350.

[46] *Ibid.*, p. 354.

[47] King: "Mixed Farming in Northern Nigeria," 1939, p. 271. See also Faulkner and Mackie: West African Agriculture, 1933; and by the same authors: "The Introduction of Mixed Farming in Northern Nigeria," 1936, pp. 89–96.

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to apply it regularly to his fields in order to keep up the fertility which formerly was restored through long forest fallow. This animal fertilizer is more important than the help the peasant gets from his animals in the way of labor. Thus the area to be cultivated may be limited by the amount of manure available, rather than by the extent of land that can be plowed.

Van Beukering, in his summary of the results of the ladang *enquête*, is of the opinion that similar practices should be introduced in the Outer Islands of the Netherlands Indies; but the pasture problem must first be carefully studied before mixed farming can be widely established in the Indies. Where animal manure is not available, the composting of vegetable waste, or even of crops grown for this specific purpose, supplies an excellent fertilizer.

The intensification and modification of shifting cultivation are less difficult in flat country than on sloping land where there is the hazard of soil erosion. Perhaps the most obvious solution would be to move the population from mountainous land to the plains and valley floors, but this can be done only in areas where population density is low. In Southeastern Asia the density of population on the plains is usually so high that, should it be possible to bring malaria under control, a movement from the plains to the uplands and mountains would be desirable rather than a migration in the opposite direction. Another solution would be to have the shifting cultivator plant permanent tree crops to protect the soil against accelerated erosion. Steep slopes which now produce but a single moderate rice crop every few years could be made more productive if planted with perennials. The cultivator could then buy his staple food with the money obtained from the sale of the crops harvested from his trees.

The speed with which the change from shifting cultivation to permanent cultivation may be made will depend both on the geographical environment and the cultural level of the community. Shifting cultivators with permanent villages and a regularly established rotation of fields will respond much more readily to a reform brought from the outside than a group that is always ready to abandon its dwellings and move to a new locality.

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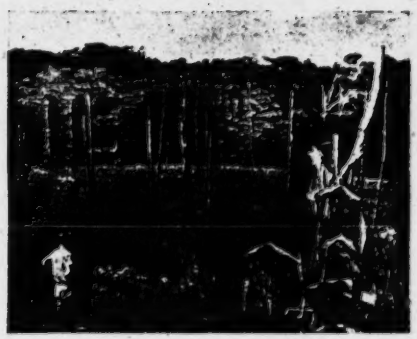

(Note—All the photographs in this book except those for which acknowledgement is made were taken by the author.)

Fig. 4 (upper left)—*Caiñgin* freshly cut and burned in second-growth forest. Cagayan Province, Luzon. (Courtesy of the Bureau of Forestry.)

Fig. 5 (upper right)—Cutting down the larger trees has been avoided by girdling. The caiñgin is ready for planting. Bataan Province, Luzon. (Courtesy of the Bureau of Forestry.)

Fig. 6 (center left)—Burning a freshly cut caiñgin. Cotabato Province, Mindanao.

Fig. 7 (center right)—Burning *kebangs*. Residency of Palembang, Sumatra.

Fig. 8 (lower left)—Ilongot's caiñgin planted with upland rice. Nueva Vizcaya Province, Luzon. (Courtesy of the Bureau of Forestry.)

Fig. 9 (lower right)—Ladang planted with upland rice. The second-growth forest in the background will be cut in a year or two. Residency of the East Coast of Sumatra.

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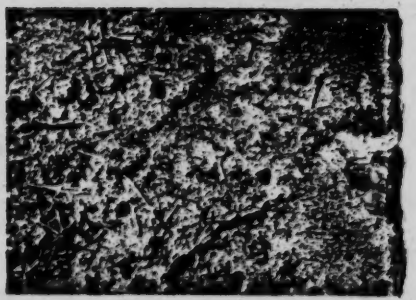

FIG. 10 (upper left)—The temporary tree-house in this *caingin* provides an excellent lookout as well as protection against wild animals. Cotabato Province, Mindanao.

FIG. 11 (upper right)—Shifting cultivator in a *ladang*, about to plant upland rice seeds. Residency of the Lampoeng Districts, Sumatra.

FIG. 12 (center left)—The man on the right is driving a planting stick into the ground, while the man on the left plants the upland rice seeds.

FIG. 13 (center right)—The holes made with the planting stick are ready for seed.

FIG. 14 (lower left)—Abandoned caingin invaded by *cogon*. Bukidnon Province, Mindanao.

FIG. 15 (lower right)—Abandoned ladang. Residency of the Lampoeng Districts, Sumatra.

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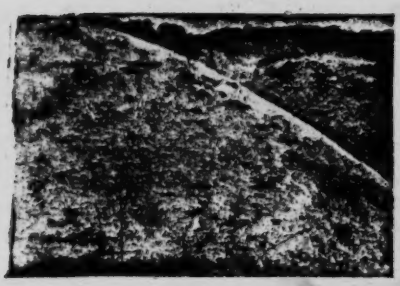

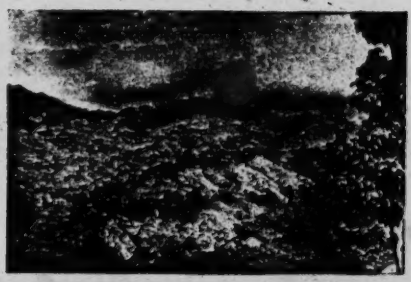

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[illegible] (upper left)—New *ladangs* planted with upland rice and maize on a steep slope. Notice the young second-growth forest on the second slope and the older forest in the background. Residency of Tapanoeli, Sumatra.

[illegible] (upper right)—New *caingins* on slopes in second-growth forest. West of Baguio, Mountain Province, Luzon.

[illegible] (center left)— Ladang of upland rice and maize on level land. Residency of the East Coast of Sumatra.

[illegible] (center right)—New caingin ready for the first planting. The flimsy hut will be abandoned, together with the caingin, after one harvest. South of Sagnay, Camarines Sur Province, Luzon.

[illegible] (lower left)—Guarding the ripening rice against birds from a temporary shelter in a ladang. The man has a permanent house in the village. Residency of the East Coast of Sumatra.

[illegible] (lower right)—Well built village house of a shifting cultivator who raises pepper in his old ladangs. Residency of the Lampongs Districts, Sumatra.

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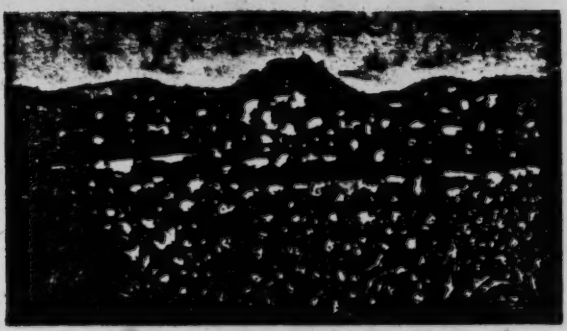

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FIGS. 22 and 23 illustrate undesirable conditions that may result from shifting cultivation.

FIG. 22—Cogonales cut and burned out in a valuable commercial forest before the holder of the timber concession had a chance to exploit it. Negros Occidental Province, Negros. (Courtesy of the Bureau of Forestry.)

FIG. 23—Cogonales in the foreground and patches of second-growth forest in the hills. The cogon is gaining the upper hand because of repeated fires, which prevent natural reforestation. Near Port Banga, Zamboanga Province, Mindanao. (Courtesy of the Bureau of Forestry.)

FIG. 24—Filipino foresters investigating the extensive cogonales of eastern Nueva Ecija Province, Luzon. (Courtesy of the Bureau of Forestry.)

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FIGS. 25 and 28 (upper left and upper right)—Pepper vines growing in an old *ladang*. Residency of the Lampoong Districts, Sumatra.

FIG. 26 (center left)—Young rubber tree planted in a rice ladang. No more rice will be planted after the second rice harvest. Western Bali.

FIG. 27 (lower left)—Young rubber trees in an old ladang that has produced two rice crops. Residency of Palembang, Sumatra.

FIG. 29 (lower right)—Closer view of a young rubber tree in the ladang shown in Fig. 27.

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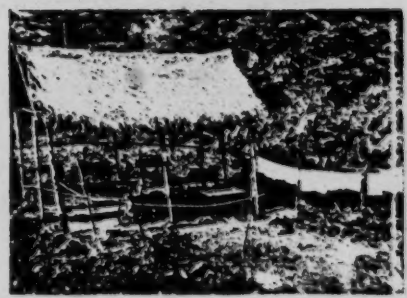

FIG. 30 (upper left)—Batak benzoin collector beside a benzoin tree planted in an old *ladang*. Residency of Tapanooli, Sumatra. (Courtesy of the Department of Economic Affairs.)

FIG. 31 (upper right)—Peasant-owned rubber garden. Residency of Tapanooli, Sumatra.

FIG. 32 (center left)—Houses abandoned by shifting cultivators in an exhausted coffee garden. Residency of Palembang, Sumatra. (Courtesy of the Department of Economic Affairs.)

FIG. 33 (center right)—Rubber mangles and sheets of rubber drying in a peasant-owned rubber garden. Residency of Djambi, Sumatra.

FIG. 34 (lower left)—Teak logs lining the road through a tobacco plantation. Between Medan and Arnhemia, Residency of the East Coast of Sumatra.

FIG. 35 (lower right)—Teak, just partially cut down to prepare for a tobacco crop. Between Medan and Arnhemia.

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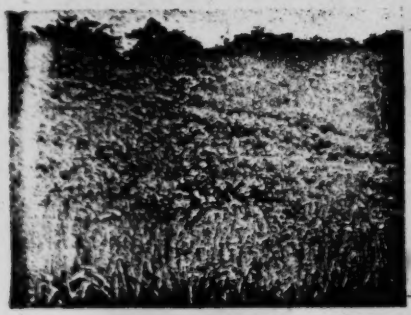

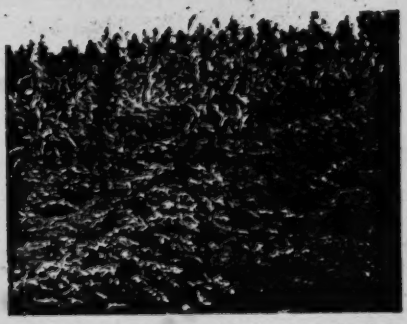

36 (upper left)—Eight-year-old second-growth forest on a tobacco plantation, being cleared for the raising of a single tobacco crop. Residency of the East Coast of Sumatra.

37 (upper right)—After the tobacco crop has been harvested the local population is allowed to raise one upland rice or maize crop. Notice the bushes and trees, which the rice-growers must not destroy lest reforestation be retarded. In the background a tobacco-drying shed. Residency of the East Coast of Sumatra. (Courtesy of the Experiment Station of Deli Planters Vereeniging.)

38 (center left)—Upland rice following a tobacco crop. In the background a second-growth forest consisting of *Albizzia falcata* and in front of it a strip of *Leucaena glauca*. Residency of the East Coast of Sumatra. (Courtesy of the Experiment Station of Deli Planters Vereeniging.)

39 (center right)—Two-year-old second growth on a tobacco plantation. Residency of the East Coast of Sumatra.

40 (lower left)—A section in a teak forest which has been cut by shifting cultivators working under the *taungya* forestry system. Residency of Madioen, East Java.

41 (lower right)—Maize and vegetables between pine trees planted at an altitude of 1900 meters by shifting cultivators working for the Forestry Service. Slope of Goenoeng Tangkoebanprahoe, Residency of Batavia, West Java.

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This group of photographs was taken at the Soil Erosion Experiment Station near Tjiwidej, Residency of Priangan, West Java.

FIG. 42 (upper left)—Unterraced slope under cultivation.

FIG. 43 (upper right)—Terraced slope under cultivation.

FIG. 44 (lower left)—View of the catch basins.

FIG. 45 (lower right)—Closer view of the upper catch basin shown in Fig. 44.

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Chapter III

THE SEDENTARY CULTIVATOR

241 Sedentary, or permanent, cultivation of land is much more vital to the economy of the countries of Southeastern Asia than is shifting cultivation. The majority of peasant cultivators obtain their livelihood by tilling the same piece of land year after year. The continuously utilized arable land, however, is not all cultivated in the same way throughout Southeastern Asia. We may distinguish three main categories of arable land: garden land, surrounding the houses and villages; wet land; and dry land. These three classes of land are devoted to different crops and vary so much from one another in size and reliability of yields, and therefore in value that in Java, for example, the social status of a man depends upon the type of land that he cultivates. There are districts in Java where only those peasants who own wet land, houses, and garden land have the full rights of a villager.

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The Garden Plot

244 Garden culture on land surrounding peasant houses in Java is devoted to a large variety of crops, ranging from fruit trees to plants that are not required in large quantities but only to supplement the diet and add flavor to the daily rice meal. Ochse and Terra, who have made exhaustive studies of garden culture, are of the opinion that it is a remnant of "primitive grainless hoe culture," in which all the useful plants found in the forest were concentrated in plots near the dwellings. Originally, the number of plants grown in the garden was greater than it is today, for some plants have been taken out of this economy to be grown on a larger scale in fields. The origin of garden culture explains, according to Ochse and Terra, the truly amazing variety of plants that are found on garden land.[1] Sollewijn Gelpke, a leading expert on native agriculture in Java during the past century, remarked on the richness of the gardens:

> Whoever strolls around a compound and takes things in with a botanical eye will see before him a variety of plants of which the uninitiated can have no conception. . . . Such wealth of vegetation is still more impressive to him who approaches it from an economic point of view. He sees palms, bamboo, bananas, and other trees that resemble each other closely, bearing fruit and giving support to various climbing plants.[2]

244 137 Often one is able to distinguish three levels, or stories, in a garden. The ground story consists of low-growing plants, especially tuberous plants that tolerate shade, such as elephant yam (*Amorphophallus campanulatus* Bl.), white arrowroot (*Maranta arundinacea* L.), "purple arrowroot" (*Can-*

[1] Ochse and Terra: "Het onderzoek," 1934. See also Terra: "De voeding der bevolking," 1932, pp. 552–593.

[2] Sollewijn Gelpke: Naar aanleiding, 1901, p. 203.

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gated fields. One of the great advantages of garden culture over field culture is that there is always something ready to harvest from the former and therefore something to sell when money for daily household needs becomes scarce. Another advantage is that the garden supplies the family with a great variety of side dishes rich in vitamins; the vegetable proteins of the garden produce are also of high value.

As to the possibilities of improving garden culture, these two authors state:

> It is very evident that an improvement of the compound horticulture is a very difficult problem through the highly varied and dense planting of these compounds as a result of which they come to resemble a very complicated symbiosis. But for all this it must be possible by systematic investigation to improve not only the quality but also the quantity of the production. It may be said that the compounds with their story or layer formation superficially considered will find no favour in the eyes of western agriculture, but they are an essential link in the native production apparatus.[3]

The alarming decline in the welfare of the people of Java in the face of a mounting population prompted Netherlands Indies officials to examine every possibility of improving the peasants' condition. This accounts for the studies of Ochse and Terra. Lacking detailed studies outside Java, we are obliged to depend upon scattered references of uneven value.

Credner states that in Thailand practically every house has a few trees on the lot, and the villages are often hidden by tree clusters. The greatest intensification of garden culture is found on the right bank of the Mae Nam Chao Phraya (the Menam) in Bangkok Noi, just opposite Bangkok. Here irrigation is employed in garden culture, a technique not usually found in Southeastern Asia. The gardens are surrounded by walls 1 meter high and are traversed by trenches 2 meters apart. The beds between the trenches are elevated. The trenches work both as drains and as irrigation ditches. Small sluices control the water. In the gardens there is a great variety of fruit trees and palms which climbers, such as *Piper betle* L., use as supports. In the trenches the peasants grow lotus and water chestnut (*Trapa natans* L.).[4] Zimmerman, in his survey of rural Thailand, points out that in most regions the peasants rely too much on one crop, rice, and he recommends in several instances improvements in the cultivation of the home lots so that families may have a better supply of fruits and, above all, of vegetables. In the Khlong Rangsit section he observed that "on account of the lack of homestead and village sites among the people there is no gardening and home production of food."[5] This observation may be applied to Southeastern Asia in general. Wherever the dominant form of land tenure is tenancy the flimsy shack of the tenant has no mixed fruit and vegetable garden around it, for his status is much too uncertain. A tenant

[3] Ochse and Terra: *op. cit.*, pp. 371–372.
[4] Credner: Siam, 1935, p. 246.
[5] Zimmerman: Siam, 1931, p. 307.

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yields. On the whole, the farmers of Cochinchina cultivate their fields much less intensively than do those of Tongking and Annam. Hardly any double cropping of rice is practiced in Cochinchina, nor is much of the riceland cultivated during the dry season.

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In 1941 changes in the political boundary between Thailand and French Indochina reduced the importance of Cambodia as a rice-surplus region of Indochina. Cambodia lost the Battambang area, west of the Tonle Sap, which in recent years had developed into a prosperous rice-growing district, possessing one of the most modern rice mills of Indochina.[47] The province of Battambang has a rice area of 134,000 hectares, whereas Cambodia, before the boundary change, had about 800,000 hectares of riceland.[48] Most of this is cultivated during the rainy season and depends entirely upon the rain caught in the fields. Around the Tonle Sap and along the Mekong a good deal of floating rice is grown, and some riceland is planted after the summer flood has receded. The crop from this land is harvested in the dry season and may be considered a dry-season crop, although it begins to grow during the latter part of the rainy season and profits from the floodwater that has spread over the land.

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The deltas of the Red River and of the Mekong, the two "rice baskets" of Indochina, differ greatly when it comes to the final disposal of the crop. The contents of the Tongkingese basket barely meet the needs of the local population, whereas a large part of the Cochinchinese rice may be exported, since the production far exceeds the local consumption. The delta of the Red River is densely settled; but Cochinchina, especially the western part, is still a pioneer country with a relatively low population density. The importance of Indochina as a rice-exporting region is based entirely on the production of rice in the south, particularly in Cochinchina and, to a lesser extent, in Cambodia.

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Dry Fields

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Dry fields[49] represent the third type of land under permanent cultivation in Southeastern Asia. The steady increase in the foreign demand for tropical products raised on dry fields, combined with the growth in local food requirements, has led to a great expansion of the area under permanent cultivation. The continuous use of unirrigated land, however, offers one of the most troublesome problems of tropical agriculture, because of the difficulty of preventing soil depletion. Erosion is especially active in a

[47] Thompson: "War and Further India's Rice," 1941, p. 183.

[48] Gourou: L'utilisation du sol, 1940, p. 309.

[49] In the following discussion we shall exclude non-irrigated or dry land that comes under the regime of shifting cultivation. Sometimes a non-irrigated field lying fallow may have the same appearance as a recently abandoned ladang. But the essential difference is that under permanent culture land tenure is more highly developed than under shifting culture; so that a permanent field lying fallow belongs to an individual who, after a short period, will again cultivate it, whereas an abandoned ladang gives the former cultivator no claims for the future.

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climate characterized by heavy rainfall often concentrated in one season, and it will, unless checked, lead to the exhaustion of the fertility of the soil at a comparatively rapid rate in the tropics. In Southeastern Asia permanent dry fields are usually found on sloping ground exposed, much more than in the case of garden or wet-rice land, to the danger of erosion. Garden land is protected by dense stands of perennials, while terracing and dyking guard wet fields against destructive erosion. The terracing of dry fields is one of the most effective ways to control the loss of soil, but, since terracing requires so much labor, we find terraced dry fields only in densely settled regions, and even there the peasants often will not undertake this additional labor unless they are urged to do so by the authorities. As long as there is enough land available, the peasants prefer to let dry land recuperate by lying fallow for short periods rather than to protect it by terraces; but with the increasing density of population and the consequent shrinkage in the size of individual farms this practice is no longer possible (Figs. 61–64). [1]

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As early as the second half of the nineteenth century, K. F. Holle, the agricultural adviser in the Netherlands Indies, constantly stressed the need of controlling erosion on dry fields. Following his advice, the government, in Article 5 of the 1874 Ordinance on Alienation of Domain Forest Land, stipulated that permission to clear domain land on sloping terrain be given to the peasants only on condition that they terrace the slopes and thus control erosion.[50]

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The need for the terracing of slopes became especially apparent in Java in the coffee lands that the peasants had to plant under the forced-culture system. Many of these lands were completely exhausted after a few years, and Holle showed that this rapid exhaustion occurred because the topsoil had been washed away by heavy rains. In 1873 he wrote detailed instructions for the terracing and cultivation of coffee lands.[51] However, Holle's instructions and the stipulations of the Ordinance of 1874 were subjected to criticism and often ignored. In 1889, therefore, the Government of the Indies asked Forester Berkhout to investigate the practical results of the application of terracing to tegalans. Berkhout's report summarizes the arguments for and against terracing; these still make interesting reading.[52] The arguments against terraces on tegalans were put forth as follows:

1. The people are not used to terracing dry land.
2. Terracing demands more labor.
3. It reduces productivity in the first year if the land is rather steep and the humus layer thin.

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[50] Article 5 reads: "Dat bij hellend terrein zoo er gevaar bestaat voor afspoeling van de bouwkruin, de aanleg geschiede terrasgewijze, en voorts onder zoodanige voorwaarden als plaatselijke omstandigheden wenschelijk maken." Ontginnings-Ordonnantie, *Staatsblad 1874*, No. 79.

[51] Nederlandsch-Indische Maatschappij: Handleiding, 1873.

[52] Berkhout: "Terrassenaanleg," 1892, pp. 139–141.

1 [See p. 117, cat. 116 --Analyst]

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The Agricultural Advisory Service of the Netherlands Indies for many years carried on experiments with green manures and recommended a variety suitable for different conditions, but the main obstacle to the application of their research was the difficulty of introducing green manure into a crop rotation. Some of the green manures used in Java are *Crotolaria anagyroides* H. B. and K., *Crotolaria usaramoensis* Baker, *Tephrosia candida* DC. and *Tephrosia vogelii* Hook., *Calopogonium mucunoides* Desv., *Centrosema pubescens* Benth., *Centrosema plumierii* Benth., and *Mimosa invisa* Mart. Green manure requires a relatively large amount of water in order to produce the desired foliage. If there is sufficient water, the peasants can also grow other crops such as legumes, which supply food as well as fertilizer. Most of the peasants of Java have so little land that they cannot afford to sacrifice a single food crop from a field in spite of the probability of an increased yield after the green manure has been plowed under. Although it is preferable to grow green manure unmixed with other plants, the planting of a green manure crop among the food crops is recommended where land is scarce. This is done in Java, especially in maize and cassava fields. The specific green manure that is chosen should meet the following conditions:[59]

1. It should have a rapid growth,
2. An abundant production of leaves,
3. No excessive development that might harm the main crop,
4. An absence of climbing or trailing stems;
5. The plant should have deep roots with many nodules;
6. It should not become woody too easily—as herbaceous plants decompose much more quickly; and
7. It should be immune from the diseases and insects that attack the main crop.

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Another agricultural practice common to many parts of the world, especially the tropics, is mixed cropping, which seems to bring in its train some of the advantages of rotation.[60] Nicol stresses the great importance of having leguminous plants grown among non-leguminous plants. He points out that the legume component in the mixture provides nitrogen to the non-legume.[61] In various parts of India—for example on the Bombay Deccan—bulrush millet (*Pennisetum typhoideum* Rich.) is grown with various legumes. This can be done year after year without greatly affecting the fertility of the soil. No crop rotation is practiced here. The proportion of bulrush millet to legumes varies according to the quality of the land; the poorer the land, the smaller the proportion of millet and the larger the proportion of legumes. Wallace wrote in 1887:

The growth of mixed crops is a widespread practice which is well worth consideration and study. . . . The advantages . . . are distinctly great. . . . There is

[59] International Institute of Agriculture: Use of Leguminous Plants, 1936, p. 60.
[60] Willis: Agriculture in the Tropics, 1914, p. 29.
[61] Nicol: "Mixed Cropping," 1935, p. 189.

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but one explanation of the existence of these practices, viz., that they have been found advantageous after long experience and much careful consideration on the part of a body of workers who, for power of observation and an intelligent interest in and knowledge of every day occurrences, would put to shame those classes which hold a corresponding position in educated Europe.[62]

Well known is the American Indian's practice of interplanting maize, beans, and squash. Chinese and Japanese peasants practice mixed cropping widely, and we may observe it almost everywhere in Southeastern Asia. Intensive mixed cropping in the garden culture of Java has already been described (see above, pp. 43–45), but there is relatively little interplanting of legumes with non-legumes. On dry fields the peasants of some parts of Java are accustomed to interplant cassava and maize—both, however, non-legumes. Whereas maize can be harvested after 100 days, cassava needs up to a year or more of growth. Cowpea (*Vigna sinensis* Savi), Goa bean (*Psophocarpus tetragonolobus* DC.), Lima bean (large) (*Phaseolus lunatus* L.), and hyacinth bean (*Dolichos lablab* L.) are also interplanted with cassava. On tegalans in Bali, in 1941, I observed the following crops grown with upland rice: *Eleusine indica* Gaertn., sesame (*Sesamum indicum* L.), and pigeon pea (*Cajanus cajan*). This last enriches the soil as a result of its large production of leaves as well as by the nitrogen in its nodules.

Kaserer has noted that there is little or no interpenetration of plant roots of the same species when they are grown together, whereas a significant degree of root interpenetration takes place when two different species are grown in close association, the degree of interpenetration increasing with the degree of dissimilarity. In one experiment, for example, a legume and a non-legume showed the maximum amount of root interpenetration, the explanation apparently being that one plant takes up the nutrients produced, or made available, by the other.[63] If these observations are correct we have here a scientific argument for the value of mixed cropping. Further studies are needed to determine the desirability of improving and extending it in specific areas.

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Another important method of improving the fertility of dry fields is the use of compost. Vegetable composts are employed extensively in India and Africa. The masters at making compost from household refuse, vegetable waste, and human excreta are the Chinese, who cling to this method of fertilization wherever they practice truck farming in the neighborhood of urban centers in Southeastern Asia. Fungi and bacteria are used to break down suitable mixtures of vegetable and animal wastes. A method that was developed in India is the "Indore process" in which, "by arranging these mixtures in the proper way, and by watering and turning them, to supply moisture and air, the waste materials are transformed in about ninety days into a finely divided humus rich in the foods required by grow-

[62] Wallace: India in 1887, 1888, pp. 196 and 198.
[63] Kaserer: "Beobachtungen," 1911, pp. 1022–1030.

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ing crops. The process can be adapted to climate by manufacture either in shallow pits or low heaps."[64]

Dry-Field Crops Cultivated by Peasants

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The list of dry-field crops cultivated in Southeastern Asia is rather large, but there are regional variations. Cassava, for example, is commonly grown on tegalans in Java (2,300,000 acres), whereas it is unimportant in Sumatra, Borneo, the Philippines (40,000 acres), Malaya (24,000 acres), and Indochina (75,000 acres). The most important dry-field crops are upland rice, maize, cassava, sweet potatoes, peanuts, soy beans and other pulses, tobacco, and sugar cane, all of which are annuals. Of the first four, only upland rice is a native of Southeastern Asia, whereas the other three are natives of the New World and were introduced into Southeastern Asia by the Spaniards in the sixteenth century.

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TABLE IV—CHEMICAL COMPOSITION OF CASSAVA AND IMPORTANT CEREAL FLOURS

	CASSAVA (PER CENT)	MAIZE (PER CENT)	WHEAT (PER CENT)	RICE (PER CENT)
Moisture	10.75	13.41	13.65	13.12
Protein	0.87	7.56	12.35	9.85
Crude fat	1.19	2.79	1.75	0.88
Ash	1.24	1.78	1.81	1.51
Crude fiber	6.12	3.19	2.53	0.63
Carbohydrates	79.83	71.27	67.91	74.01

Source: The Cassava Industry in the Philippines, 1939, p. 7.

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The inhabitants of Southeastern Asia have long relied upon root crops, fruits, leaves of various plants, and wild roots and tubers gathered in the forests, as well as upon rice. Scheltema refers to a number of early statements which indicate that "rice was not yet the principal food for a large portion of the native population [of Java] as late as the first part of the 19th century and that the rice diet has become much more important in the course of the past hundred years" as a result of the great extension of the cultivation of irrigated rice fields.[65] If it is correct that the rice consumption per capita increased during the past century, the opposite trend has been evident during the present century. For a while the increase in the area of irrigated land was great enough to allow for a larger rice production, but with the steadily increasing pressure of population the peasants now have to depend more and more upon unirrigated land. Thus the production of dry-field crops is gaining in importance.

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Authorities in Southeastern Asia have been especially worried over the increase of cassava production and consumption. Because of the exhaustion of the soil fertility on many dry fields, the growing of upland rice and

[64] Worthington: Science in Africa, 1938, p. 387.
[65] Scheltema: The Food Consumption, 1936, p. 10.

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maize has become unprofitable, and many peasants have changed over to cassava, which makes lesser demands upon soil fertility. The per acre yields of cassava are high, and the plant is a source of carbohydrates, fat, and protein. From the standpoint of dietary needs, however, the ratio between carbohydrates on the one hand and protein and fat on the other is unfavorable. People who live on cassava merely fill their stomachs. The insufficiency of protein intake is detrimental to their health. Table IV compares the chemical composition of cassava, maize, wheat, and rice.

Maize, as the table indicates, compares quite favorably in protein content with wheat and rice and is especially rich in fat. It has gained an important position in the diet of the people of central and eastern Java, Madura, the island of Cebu, and the Cagayan Valley in the island of Luzon. Both maize and cassava are easy to store and therefore have a great advantage over sweet potatoes, which must be consumed soon after they ripen.

In Thailand maize is an important crop on the Khorat plateau and in other regions where dry land is available. Among the root crops cassava has gained a greater importance than taro and yams. The last two are grown mainly by Chinese gardeners in the neighborhood of large towns. Cassava, too, is grown commercially by Chinese, especially near the railroad on the peninsula.

Most of the so-called dry-field crops are grown in Indochina during the dry season on land that is flooded during the rainy season and at that time produces rice. Gourou has estimated that in Tongking 100,000 hectares of land are used exclusively for the production of dry-field crops and that 350,000 hectares of irrigated land are occupied by such crops during the dry season.[66]

This practice of growing dry-field crops on irrigated land during the dry season is especially widespread in Java, where population pressure is so great that the peasants have to use every possible means to enlarge their food supply. If there is not enough water available to grow a second wet-rice crop, they will always try to get a second harvest of quick-growing dry-field crops during the dry season.

In contrast to the peoples of Java, the Filipinos do not, as a rule, go in for the raising of dry-field crops on wet riceland during the dry season, although this should be possible if the land were cultivated. There is enough water in the soil a short distance below the surface for the growing of crops practically everywhere during the dry season. Repeated tilling would keep the soil soft and fine so that water could move upward by capillary action to replace that which is lost through evaporation. Cultivation would enable plants such as maize, peanuts, and soy beans to grow on land that otherwise would be baked dry and hard. Although the ratio between cultivated land and population in the Philippines does not make a dry-season crop a necessity in most regions, there are a number of districts where the peasants traditionally raise a dry-season crop on irrigated

[66] Gourou: Les paysans, 1936, pp. 407–408.

1[See page 75, cat 116 -- Analyst]

1: Pelzer S-5 (1940-1941) 1945 AL1 Southeast Asia AL1

land. An example is *mongo* (*Phaseolus mungo* L.), grown in Pangasinan and Batangas. Alarmed by the poor rice crops in 1940 and the difficulty of importing rice from Indochina and Thailand, the Philippine Bureau of Plant Industry, early in 1941, started to distribute seed of quick-growing dry-field crops, especially maize and legumes, in order to supplement the nation's rice bowl. But the average Filipino farmer is reluctant to accept this new practice, because "it is not the custom"—a powerful argument not to be easily overcome.

Dry-Field Crops Cultivated by Plantations

The discussion thus far has been limited to the native cultivation of dry land and to annual crops. However, extensive areas of non-irrigated land are occupied by perennial crops that are grown on plantations owned by Westerners. The crops produced include tea, coffee, cacao, quinine, rubber, palm oil, coconuts, kapok, sisal, and other fibre plants. Some of these crops were cultivated for a long time without the proper measures being taken to protect the soil against accelerated erosion. Although the detrimental effects of plantation agriculture in Ceylon and southern India are notorious in the plantation history of southern Asia, results were just as disastrous in Malaya and in the Netherlands Indies. Westerners, accustomed to clean cultivation or clean weeding in the temperate zone, carried this practice over into the tropics, with the result that soil erosion was very severe on steep slopes and led to great losses in soil fertility. Today, however, these mistakes have been recognized; there is hardly a plantation that has not adopted measures to protect sloping land against erosion and level land against soil exhaustion. The planters of Java were the pioneers in this field, introducing or developing most of the protective measures. These measures include contour drains, silt pits, contour ridges, terraces, hedges, shade trees, and especially cover crops. The use of these measures varies according to the crop, or crops, produced and according to climate, soil, and slope; but the purpose of all of them is to encourage an effective ground cover and to check the rate of water run-off. The financial depression of the 1930's—resulting in the need for very strict economy and a decrease in production costs—has helped considerably to reduce the amount of clean weeding and to convince conservative planters of the value of preserving a ground cover, litter, and mulch. Such measures help not only to retard erosion but also to enrich the soil. The first Western planter who broke away from the custom of keeping the ground of his plantation free from weeds was L. M. Tyl, who in the years 1890–96 developed the "weed-system" and thus introduced the idea of a ground cover into plantation circles of Southeastern Asia. But it took many years before his idea was generally accepted. It is interesting to note here that the Asiatic-owned plantations and the small holdings producing perennial crops, such as rubber, usually did not practice clean weeding. This, in the early days, was regarded by European observers as a sign of laziness and

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poor management, but, as has been so often the case, the Westerners were finally forced to admit the soundness of Oriental cultivation practices.

As we have seen, there are two principal means of protecting the soil between tree crops: by allowing the growth of indigenous plants or weeds (in other words the development of a natural mixed cover), or by establishing a pure cover of leguminous plants, many of which came originally from the New World. Rubber planters in Malaya seem to have had more success with the first method, which has been called "the forestry method of cultivation" or "rubber forestry." [67] Of course, the growth of indigenous plants or weeds must be controlled, and this is done by slashing the undergrowth from time to time. Frequently it is necessary to practice selective weeding in order to suppress undesirable plants and encourage more valuable ones.

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Much research has been directed toward the study of leguminous cover crops which supply nitrogen, as well as foliage for green manure. This research was started in 1910 in the Botanical Garden at Buitenzorg. Some of the cover crops that have proved especially valuable and are widely used on modern plantations are *Calopogonium mucunoides* Desv., *Centrosema pubescens* Benth., *Centrosema plumierii* Benth., *Desmodium* species, *Tephrosia candida* DC. and *Tephrosia vogelii* Hook., *Mimosa invisa* Mart., *Cassia* species, and *Vigna oligosperma* Backer.[68] Several of these have already been mentioned in the foregoing discussion on the use of green manure crops in native agriculture.

Because a number of perennials such as tea, coffee, and cacao are commonly grown under shade trees, many writers seem to believe that these plants need shade. This may be true in part, but more important is the fact that the shade trees protect the soil against excessive losses of moisture and undesirable changes in soil composition, texture, and structure and thus prevent a reduction of the quantity of humus in the soil. Most of the commonly used shade trees are legumes which, in addition to shade, supply litter and nitrogen and help to increase the moisture-holding capacity of the soil, thus reducing the danger of erosion. *Erythrina micropteryx* Poepp., *Erythrina lithosperma* Miq., *Leucaena glauca* Benth., *Albizzia moluccana* Miq., *Albizzia chinensis* Merr., *Albizzia falcata* Backer, *Pithecellobium dulce* Benth., or Manila tamarind, and *Peltophorum pterocarpum* Backer are especially useful in this respect.

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[67] Haines: "The Uses and Control of Natural Undergrowth," 1934.

[68] For a very extensive list of cover crops, green manures, and shade trees, see Heyne: De nuttige planten van Nederlandsch-Indië, Vol. 3, 1927. See also International Institute of Agriculture: *op. cit.*

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may induce flooding of the valley above the narrows. The Tasek Bera of Malaya in this way reflects constrictions in the Pahang Valley;

(*e*) the presence of levees means that the zone between them and the foothills has difficulty in draining to the river after a flood or during a downpour, so the levees are generally lined landwards by broad freshwater marshes, as by the rivers across the Korat Plateau in Siam (Fig. 90);

(*f*) where local rain seasons coincide with the arrival of spates, originating elsewhere in the local rivers, the landscape cannot shed the direct rainfall rapidly and it induces marshes.

Most of the freshwater marshes are seasonally flooded, drying out quickly in spells of drought, draining when local streams are low, but then flooding to depths up to 10 ft. during wet seasons.

Some types of swamp are man-induced. When alluvial mining is being carried on, dredges and gravel pumps effectively stir up large quantities of river sediment which is carried downstream as the mining effluent (Fig. 21).

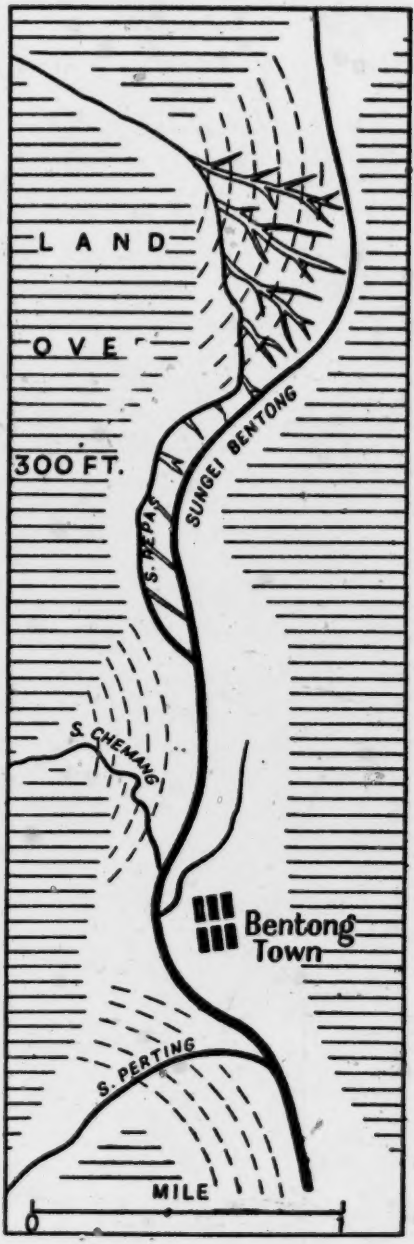

FIG. 21.—Alluvial Fans being thrust across Bentong Valley

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311 This artificially stirred sediment is agriculturally negative and it penetrates the ditches and drains of rice growing areas, gradually silting them up, often spectacularly raising the local river bed (at Serendah in Malaya, the river bed was raised 21 ft. by sedimentation over the decade 1923-33), as well as sterilising fields on which the silt spreads so that cultivation becomes more difficult as the river can no longer be kept out. The yields decrease and the fields are abandoned, swamp vegetation gradually obliterating signs of cultivation. Round the lower Malacca River may be found signs of the old field bundings within the tangle of swamp vegetation now growing there, a sign of the effects of mining higher in the river whose effluent is obliterating cultivation in lower areas. This type of swamp comes slowly and has all the appearance of nature overcoming men's efforts to farm, but it is fundamentally a result of man-induced erosions or abrasions elsewhere. Thus interference, by mining and forest clearing, with landforms stabilised over long periods, not only goes on by removal of silt and gravels carried from mining areas and topsoils removed by torrential rains on clean-weeded agricultural areas as a mark of transfer of surface materials from one area, but it also causes the obliteration of cultivation and an extension of useless marsh in the areas where this material is deposited.

133 361 Because these tropical marshes occur in zones of human significance, that is, in the flatter areas with agricultural possibilities, and along the coasts where settlement from overseas might take place, they have played a major part in conditioning the distribution of human beings in Southeast Asia. Both the coastal and inland marshes are tree-covered, making it even more difficult to penetrate, control, or cultivate them. Varying degrees of swampiness often account for the ease of development of farming in one place rather than another in Southeast Asia and a broad belt of marsh has generally proved a greater human impediment than any other topographic feature.

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Chapter Four

SOUTHEAST ASIA'S NATURAL VEGETATION

Tropical Forest Factors

The heavy, evenly distributed rainfall and constant high temperatures of most of Southeast Asia encourage continuous plant growth and a profuse, very varied flora. Because the whole year is here a growing season, plant life becomes almost overpowering in its rate of growth. This region contains more species than any other; the flora is not yet completely known, but some 35,000 species of flowering plants alone are thought to exist there (van Steenis). On Borneo at least 11,000 species have been listed, according to Merrill. This contrasts with the parallel figure of 13,000 species for the whole of Tropical West Africa (Good). Woody plants predominate and 15 per cent of the species are trees whose mature trunks are over 16 in. in diameter. The profusion of species is due to (*a*) the predominantly warm, moist climate, (*b*) the constancy of this climate over long geological periods, (*c*) the variety of relief and islands producing minor adaptations, (*d*) the rapidity with which selective and adaptive evolutionary processes can establish new characteristics in a tropical climate which has no resting season, and (*e*) the migrations of plant types from both Asia and Australia.

Southeast Asia was originally clothed by nature almost entirely by a tree cover. Only in modern times has there been any extensive clearing because apart from firing, primitive people were technically incapable of removing the forest. Some clearings became permanent for cultivation, in recent centuries, but the majority have been temporary and partial clearings, later left to natural replacement by a selective vegetation such as grass, savannah or scrub. Temporary clearings resulted largely from systems of shifting cultivation which finally abandon an area, partially cleared by fire, to a series of quick-growing plants, becoming after a few years a secondary forest which may, over prolonged periods, evolve to be scarcely distinguishable from primary forest.

The system of migrant agriculture or shifting cultivation, in Malaya called *ladang* and in Burma *taungya*, is widespread through-

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out Southeast Asia and it may be this form of nomadism has in fact operated so long that it affects nearly every acre of the region, thereby exercising a distinct selective action on the whole forest (Sauer). Much forest which we call "primary" may be senile secondary. This is evident in more densely populated areas such as Java and Tonkin, and over the centuries may have no less influenced the forest types of even thinly populated zones, as Borneo still is. In this sense "primary forest" is a relative term, to be retained for convenience rather than as presupposing an absolutely virgin tropical forest.

Two main types of primary lowland forest may be distinguished, the critical factor being drought:

1. In those zones astride the Equator where no season may be called dry, the natural forest is a tall, leafy, congested and evergreen type known as Tropical Rain Forest, sometimes called Equatorial Rain Forest. It may even occur well away from the Equator, towards the northern limit of Southeast Asia, where certain local conditions create a more continuously wet climate than is normal for the latitude.
2. In localities where there are several consecutive months practically without rain, a shorter and more open forest type develops: it has deciduous foliage on the whole, and considerably fewer species. Deciduous Tropical Forest is more generally known as 'Monsoon Forest' and occurs over huge areas in eastern Java, Burma, Siam and Indochina.

Between these Tropical Rain Forests and Monsoon Forests, there are intermediate types and transitional areas where no single meteorological criterion can be used to define the boundary sharply. Within both types, local peculiarities of soil porosity, number of rain-days, relief, exposure and aspect all induce minor variations. In any given unit of this mountainous region, three zones of vegetation may be distinguished within both main forest types, these zones being more distinctive in their differences than the variations of vegetation from one part to another of this huge region. These zones are: (1) coastal vegetation, (2) lowland vegetation, (3) mountain vegetation.

(1) Coastal Vegetation

On shores predominantly sandy, short herbs, grasses and shrubs with creeping stems and fleshy leaves are found; these plant

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134 induces an upflow of groundwater which evaporates and thereby precipitates solubles in the topsoil. These have sometimes been called the Savannah Soils, found extensively in Siam and Indochina. The type occurs not only where the climate permits but also where destruction of marginal Tropical Rain Forest has gone on at a rate faster than natural replacement. Because tropical forest soil works with a very small quantity of plant nutrients circulating rapidly in a cycle from soil to leaves and back again to soil, the balance is delicate. Where the forest is almost virgin, natural fires do little damage, but persistent burning by men may break the cycle of nutrients and release altogether the small initial capital of solubles. The iron concretions under such conditions become firmly cemented into subsurface platforms inimical to anything except coarse tropical grass and the topsoil is exposed to rapid removal by torrential storms. The more accessible laterites which received early examination were often under vegetation of the savannah type and they were thought at one time to be signs of a change of local climate, from Equatorial to Savannah, whereas in fact they reflect over-destruction of the original tropical forest, followed by such a change of soil type that the forest cannot re-establish itself. Because laterite is very porous, rain falling upon it may be heavy yet quickly passes beyond the reach of plants, carrying all plant nutrients away, thereby preventing regrowth of the original vegetation cover.

Natural savannahs in Southeast Asia are noteworthy for their extensive iron concretion layers which provide support for the view that vertical fluctuation of subsoil water is a factor in the formation of lateritic iron-pan.

Soils and Agriculture

134 The different types of tropical forest induce minor differences in
• 241 the soils beneath them, which assume major significance when the forest is cleared for cultivation. The limited supply of plant nutrients explains that paradox between the apparent fertility of an elaborate and profuse forest vegetation and the poverty of the soil when the forest is removed, the cycle of nutrients broken and most solubles washed away. Eventually clearances in the forest mean an increase in the outflow of nutrients in solution or suspension which are finally distributed into the swamps, the estuaries and the sea. To some extent the practice of burning, which reduces the forest to

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ash, lying for a while upon the surface, returns to the soil part of the chemicals of plant structure, yet unless steps are taken to retain this "capital" by terracing or cover crops, the ash quickly dissolves and disappears into the streams. Good crops may be obtained by utilising this soil capital immediately, but it can last only for a season or two, after which the natural infertility of laterised soils becomes apparent. It is not so serious with isolated native clearings, done under the shifting cultivation system, because each clearing is so small, and surrounded by forest, that lost soil nutrients are not carried far before they are recaptured into the forest ecology by the tangle of adjoining vegetation. When shifting cultivation is done too frequently over the one patch, that is, more frequently than, say, once in twenty years or so, then progressive impoverishment of the soil takes place. Maintenance of fertility in clearings is easier in less maturely laterised areas and where there is at least a short, dry season to interrupt the depletion processes.

The basic volcanic rocks of Java as well as the recent ash and mud flows contain chemicals which weather to plant nutrients and, being in addition very young in the laterising cycle, they produce fertile soils. On the older lavas and on the acid outpourings, a maturer stage of laterisation has been reached to produce soils no better for agriculture than other parts of the Sunda Platform. A new volcanic outburst, while creating temporary havoc, may ultimately produce local agricultural prosperity because it brings a new supply of plant nutrients. The elaborate terracing of new volcanic ash landscapes is only partly due to population pressure: it equally reflects the need to restrain the run-off and to hold back the solubles as long as possible.

Apart from the loss of soil fertility due to rapid solution, all bare or clean-weeded soils in the tropics suffer from mechanical erosion by the violent torrential rainstorms. Rainfall of tropical intensity rapidly gullies all bare landscapes and is particularly evident on the less cohesive ashes of volcanic cones, so that another reason for terracing is to offset gullying. Tangled vegetation prevents mechanical soil erosion having any great significances in forested areas, but in Java, where recent ash and intensive cultivation combine to facilitate this type of erosion, rivers contain from 300 to 2,000 gms. of silt per cubic metre; the Irrawaddy has about 750 gms. suspended in each cubic metre. (The Seine and Rhine only contain about 50 gms. of silt per cubic metre.) From tropical forest in a

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Chapter Twenty-two

SOUTHEAST ASIA AGRICULTURE

241 SOUTHEAST Asia has several agricultural types which are, however, less related to major climatic or environmental differences between one place and another and more to differing rates of agricultural development. To these rates of development the greatest impulses have derived very largely from conditions outside the region and most of the crops concerned have been introduced from outside. The system of shifting cultivation, often described as indigenous to Southeast Asia, is associated with all tribes and groups entering Southeast Asia overland from continental Asia, and the key crops of today, rice, sugar, tea, coffee cotton, rubber and maize have all been brought from overseas and cultivated largely with the object of sales overseas. Prior to the introduction of these plants, agriculture centred on root crops, on sweet potatoes or yams, which are still staples for the more isolated and hence more primitive groups.

SHIFTING CULTIVATION

Of the agricultural types particular interest attaches to shifting cultivation because it represents a special stage in the evolution from hunting and food gathering to sedentary farming. Within this style considerable variations exist, from the clearing used for cultivating yams and bananas, probably the earliest form of land utilisation by peoples wandering through the jungles, to shifting cultivation of coffee and pepper by farmers intending to sell these crops, which are so exacting in their soil requirements. Some shifting cultivators are true wanderers: the whole group, family or tribe, moves on to a new location when it abandons one clearing for the next. Others are sedentary farmers, staying in one village all their lives, but varying the piece of ground they cultivate from time to time, abandoning the old piece to secondary forest growths, which can be thought of as a form of fallow. This last type has a long tradition in Java, the Philippines and Indochina, and has blended with the custom by which a tract of land belongs

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241 to a group, the individuals of which choose or are given, every now and again, different portions to cultivate for themselves.

231 Within Southeast Asia the shifting cultivation system has no relation to the needs of domesticated animals. There is no evidence here that the simpler tribes have been primarily cattle grazers, except in so far as all Mongoloid types coming south overland

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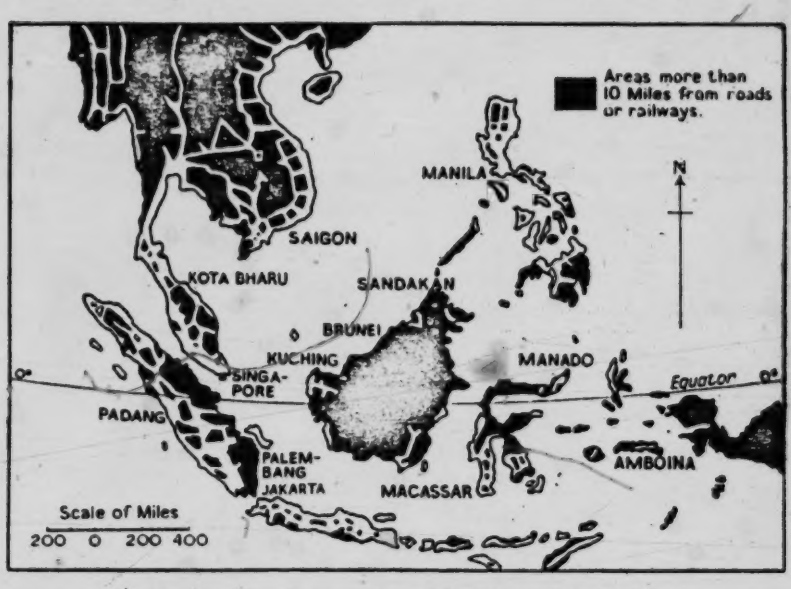

FIG. 111.—The Accessibility of Southeast Asia by Land

231 from the grazing grounds of Tibet and farther north may, at remote times outside this territory, have been associated with animals. Inside Southeast Asia, cattle do not fit well into the ecology of climate, vegetation and pests, and the disinterest in animals has become part of the religious tradition; Buddhists and Hindus do not eat beef, Muslims will not eat pork and even the primitive animists have similar inhibitions. Wherever today there has grown up a cattle system, it relates to the ploughing needs and is concerned with buffaloes or small oxen and does not derive from an earlier tradition of cattle farming or nomadism.

241 Shifting cultivation is a system well adapted to large empty areas where soils are poor and the rate of soil erosion high. As soon as population increases, shifting cultivation, which needs each cutover area to stand unused for 7 to 10 years before being

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recultivated, rapidly overtaxes the capacity of the forest vegetation to reassert itself. Hence much of Southeast Asia has been progressively overburnt by the increasing forest population and the natural cover has selectively changed towards the savannah vegetation type, a progress speedier in the drier zones where the regrowth rate is slower. Overburning caused by overpopulation in turn induces rapid soil erosion, affecting the load and silting of river systems, possibly disturbing settled agriculturists far down the valley and remote from the overburnt area. For these reasons shifting cultivation has generally become illegal, yet it still persists in areas not easily accessible or amenable to control and probably even today as much as 5 million acres of temporary clearing each year is being cultivated over Southeast Asia, and between 40 and 50 million acres of clearings in the forests is being cultivated or is recovering from recent temporary cultivation—an area not far short of the total area of Siam. From the shifting agricultural system, very little that is of trading or commercial significance derives; the proportion in coffee and pepper is negligible. As a whole, shifting cultivation is for subsistence only, yet it is an integral part of the regional farming tradition.

Subsistence Farming

Farming of the ordinary sedentary type has in this region evolved from shifting cultivation as pressure of population on the land increased. Fixed cultivation can only be sustained where local conditions prevent soil exhaustion and soil erosion, or natural conditions counteract these inevitable effects of cultivation. Thus farming gravitates to the localities dry for a part of the year, where leaching is a periodical rather than a permanent process, to localities where erosion and leaching are negatived by altitudes nearly at base level, to zones where the soil is the accumulation of fertile elements from other areas, or to zones of young soils rich in nutrient chemicals. The dry zones are away from the Equator and towards the "monsoonal fringes" of the tropics; flat flood plains beside mature streams are subject to little erosion and leaching; deltaic and basic volcanic soils remain fertile for long periods. These facts underlie the pattern of sedentary farming in Southeast Asia which occupies a total area of almost 97 million acres.

The greater part of this farmland, about two-thirds, is given

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241 over to subsistence farming, a system where practically nothing leaves the farm, which only grows what the family needs for food, the family needing all that it grows. Subsistence farming is at once deeply rooted in the tradition of the people and at the same time isolation, difficulty of access and absence of communications largely force it upon much of the region, which remains for the greater part as isolated now as it was several centuries ago, and must even grow its own fibres for textiles. On subsistence farms the interest centres on rice, an almost universal staple in Southeast Asia, and only in the most congested areas, such as the Vizayas and Java, is there any well-established practice of growing some other food as substitute for rice. Rice dominates the diet even where local conditions do not seem favourable, as in the dry zones of Burma and Siam or in the relatively gloomy, rain-soaked areas immediately round the Equator. At least 90 per cent of subsistence farmland is under rice, the balance of supplementary food needs (coconuts, spices, fruits and pulses) occupying a very small fraction of any one farm and often being gathered wild rather than cultivated. The dominance of rice, even among the hill peoples, is the more remarkable because the plant was apparently introduced by Indian colonists some time about the middle of the first millennium, since when thousands of varieties have been evolved to suit the subtle differences of local climate, seasons and soil.

In total, Southeast Asia subsistence farming has continued with methods evolved locally centuries back. The hoe or mattock and the dibble are still the only soil-working implements in many areas, even on paddyfields, but ploughs of the soil-opening rather than the soil-turning type have become widespread, generally home-made and entirely of wood, that raw material ubiquitous in this terrain. With the plough came the need for draught animals and most subsistence farms now have one buffalo or ox per family, the former being favoured towards the Equator, the latter in the drier or more seasonal areas.

Commercial Farming

Farming for crops intended to be sold, that is, commercial or cash farming, came late to Southeast Asia. Except in one or two districts of the Philippines and Java, cash basis farming is scarcely a century old and many types of crude adjustment to this innovation

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may be found. The oldest cash farming of Southeast Asia was the spice trade of the Moluccas, but even at its peak that trade involved very few areas given over exclusively to spices, which for the greater part were collected from farmers each with a tree or two, rather than a number of acres devoted to a crop of spices. The crux of the matter at that period was that nothing cultivated in Southeast Asia apart from spice was transportable to or of use to the world's population centres overseas. To a large extent over the present millennium Southeast Asia has been an absorber rather than a supplier of goods or commodities; only in the last hundred years or so has the condition changed, not so much by new demands for Southeast Asia products as for crops transferred to Southeast Asia for production.

Rice.—Commercial agriculture in the whole region occupies about 35 million acres and has taken two forms, both strongly influenced by European interests: farming food crops for sale, and farming non-food crops for sale. Of the food crops, sugar was the earliest successful innovation established in Java and the Philippines soon after European colonisation began, and intended for export to Europe. Today at least half the area devoted to crops grown for export is in rice and, taking into account the amount of rice grown for cash sales in deficit regions inside each territory, the proportion may reach as much as three-quarters. Upon commercial rice production depends the possibility of workers leaving their own farms and devoting their full time to non-food cash crops, so that the workers on rubber, cotton, hemp, coffee and sugar plantations have provided a great demand for Asia's staple cereal, supplies of which have been vital to the development of plantation and mining industries of Southeast Asia and, incidentally to the industrialisation of other parts of Asia. The bulk of the rice produced in Southeast Asia for export has gone to India and China, where a condition approaching the limit of rice-growing has been reached, and to Malaya and the Outer Islands of the East Indies. Japan too was becoming a major rice importer until 1941. All this rice export came from Burma, Siam and Indochina in that order of importance, territories which have pioneered in rapidly expanding commercial rice production to form the pool, the only rice-pool in the world, from which other areas have made up their deficits. Moreover the commercial production of rice in Southeast Asia has been steadily increasing over the last 20 years—the average

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to smallholder systems, leading to the smallholder becoming an exponent of diversified rather than single crop cultivation.

While the region has sought to escape the consequence of overmuch dependence on one or two cash crops, Southeast Asia subsistence farming is really already highly diversified. Moreover, the region as a whole must be considered reasonably well diversified in the range of commercial crops it produces, even though individual districts within Southeast Asia are monocultivated rather than polycultivated.

Effects of the Second World War

During the 1941–42 campaign, battles were fought through Burma, Malaya and the Philippines. More military action took place in Burma and the Philippines over the year 1944–45. The direct long-term effects of these campaigns were not emphatic because agriculture and arboriculture cannot be "scorched" and denied to the enemy on a large scale. The war in these territories devastated internal communications, broke down the systems of internal trade, removed the means of communication between different parts of Southeast Asia and destroyed the channels to those overseas markets which had been the principal destination of commercial agricultural produce. Breakdown of external trade channels occurred in all Southeast Asia territories whether campaigns took place in them or not.

The first consequences of this disruption, as distinct from destruction, were to place a premium on subsistence farming, to cause all commercial cultivation to fall into desuetude, to undermine confidence in agriculture for cash, to cause the loss or destruction of draught cattle which were taken away for military use, to disperse labour forces, and to stimulate self-sufficiency policies. Very little of the perennial tree acreage, such as of rubber, was cut down—only 6 per cent in the case of Malayan rubber—yet it was the commercial production which suffered most from disruption, which created in the postwar period considerable difficulties for those territories needing imported rice for the labour to rehabilitate commercial farming and industries. Agriculture itself, where labour was available, rehabilitated quickly; all but 2 per cent of Malayan rice acreages were back in cultivation during 1945–46 and rubber made an equally quick comeback, so

that about one-third of its prewar estate area was being tapped in 1947, representing two-thirds of the area tappable.

In the food crops, surplus margins were more slowly restored. Exports of Southeast Asia rice totalled about a million tons during 1946, as against a combined export of 5.7 million tons annually for 1936–40. The drop in production of this staple was greatest in the case of Burma because there the dislocation by war had been greatest, but by the 1946–47 season, about two-thirds of Lower Burma rice acreages were back in cultivation, as against half in 1945–46. In Cochinchina over 70 per cent of the rice area was being cultivated in 1946–47. Siam which was untouched by military campaigns reported 10.6 million acres under cultivation in rice for 1946–47 (22 per cent more than 1939–40)—the only territory to show a substantial increase of rice acreage in the immediate postwar years.

A postwar feature has been the general decline in rice yields, mostly an effect of loss of draught cattle, though to report low yields was a convenient cover for black market sales. The consequence of lost production in local food was felt more in places like Malaya which has specialised in non-food commercial agriculture, than in any other territories of Asia, which customarily needed to import only a small margin and not the majority of their rice. For the Philippines in 1947, the United Nations reported that *per capita* consumption of rice was actually higher than in 1939 by about 5 per cent.

Since labour shortage has been prominent as a factor operating against postwar commercial agriculture, the subsistence farmer and the diversified smallholder have assumed far greater significance than before. Over 55 per cent of Malaya's rubber production for 1946 was from smallholders, a proportion which had been as much as 85 per cent in the early months of that year, yet fell to 45 per cent in 1950 (cf. 39 per cent in 1940).

The vegetable oils soon came back into production and by early 1947 monthly production in Southeast Asia was not far short of 1941 production and now exceeds it.

The general lowering of food acreages and of yields, combined with the enforced reversion to subsistence agricultural forms, has a special significance for Southeast Asia food supplies over the next few years, because the restricted food supply comes at a time when population is rapidly increasing, at the rate of about 20

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million people per decade, and when social policy is for raising the standard of nutrition. These two factors mean that the pre-war rice exporters are on every score likely to continue to have less margin for export. How the communities will meet this basic difficulty of supply in their staple food is not clear ; mechanisation is scarcely a solution, yields are very difficult to raise on a large scale, and there are few unused areas of high potential for rice farming, yet unless improvement is reached the labour force is unlikely to remain in non-food producing territories, rice may be for such areas a luxury and not a cheap staple, and the costs of any production must remain high. Influences of this sort in a region where average productive skill is low and slow, may cause it to become one of the world's most costly producer zones and hasten in Europe and the United States the exploitation of substitute commodities which lend themselves to mechanisation more than is the case with typical Southeast Asia agricultural products. It may happen that rapid peopling of Sumatra, Borneo and New Guinea deltas may take place, much as the continental deltas of Southeast Asia were quickly filled with people over the last 50 years; the fact that there has been previous reluctance to go to these places is no guarantee that there will be continued reluctance. Southeast Asia may even become a consumer for rice cultivated in the new areas of South America and Northern Australia. Perhaps some startling innovation of crop or technique will change the otherwise rather gloomy picture, much as the opening up of Canadian, Australian and Argentine wheatlands speedily altered the similarly gloomy outlook for European wheat-eating peoples at the end of last century.

Directions in these trends of Southeast Asia agriculture are difficult to determine because there are major stratifications of local society both vertically and horizontally which are in process of readjustment, aggravated by currency confusion and widespread ignorance. These will take time to reach an equilibrium and during that period subsistence farming and its nationalist corollary, territorial self-sufficiency, are likely to be strong influences working against a great revival of commercial activity of any sort, with the result that Southeast Asia may not continue indefinitely in its prewar role of one of the world's major sources of supply. Against this must be weighed the proved ability of tropical agriculture to respond quickly to new impetuses.

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profitable and bringing about its extension. The problem must be attacked simultaneously through drainage and irrigation, agricultural betterment and the co-operative department.' One outcome of its recommendations was the reconstitution of the irrigation department in 1932, and the investigations of the new department confirmed the previous impression that 'all over the country padi lands were steadily going out of cultivation.... Even in the fine padi plain of Province Wellesley, ...conditions were steadily deteriorating, the cultivators in debt, and their *kampongs* (villages) often indicating a state verging on poverty.' During the next few years upwards of 40,000 acres were added to the existing irrigation schemes.[1] At the same time, under the influence of the depression there was a fall in the price of rubber, and by 1934 the area under rice had grown by over 100,000 acres.

In the following year, however, with a rise in the price of rubber, the area under rice fell by 35,000 acres. Thus although there was a wide area available for extending the cultivation of rice, and the fall in the price of rubber consequent on the depression encouraged cultivators to prefer rice cultivation, which at the same time was stimulated by compulsion, by extensive new irrigation and by the discovery of more productive strains, yet, with a population that increased between 1926 and 1936 by 29 %, the area under rice expanded by only 11 %.[3]

Area under rice[2]

(acres, 000)

1924–5	654
1929–30	657
1933–4	767
1937–8	726

This brief survey of the attempts to foster and improve rice cultivation in Malaya suggests that neither compulsion nor the efforts of the agricultural service to enhance production met with much success, and it contains many lessons of general application regarding the relation between economic services and the increase of production. The failure of agricultural experts to increase native production is often explained on the ground that it is difficult 'to persuade a conservative and easy-going peasantry to improve their methods',[4] and that the economic motive, the desire of gain, does not appeal to 'natives'. This is the easiest and most comfortable explanation of all failures to enhance native welfare; it is their fault and not ours. But it is inconsistent with the facts. While the Malayan was reluctant to grow more rice, he was taking readily to growing rubber. All over the Tropical Far East, native rubber has expanded rapidly, sometimes in the face of opposition. Similarly in Java the opposition of planters and

[1] Mills, pp. 262, 272, 274.
[2] Wickizer and Bennett, p. 314.
[3] *Ib.* p. 195.
[4] Mills, pp. 251, 259.

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of some officials could not stop the people from cultivating sugar instead of the less profitable rice.[1] In Africa as in Asia the people are only too ready to substitute commercial crops for food crops, and in parts of the Gold Coast and Tanganyika the farmers are coming to depend on the market for their food.[2] Everywhere the acreage of new crops under native cultivation rises and falls with the demand. The adoption of new crops is nothing new. In Netherlands India, of all the produce now cultivated by natives, only the coconut, soya and the spices are indigenous, and even rice is an immigrant. All the staple crops have come in from abroad over a period of many centuries, and that is true also of Burma. In Africa bananas, rice, wheat, and sugar were introduced by the Arabs in the seventh century, and the sweet potato, cassava and maize are attributed to the Portuguese. In the most notable modern developments of native production, agricultural services have played a very minor role. In Burma the two outstanding innovations in agricultural practice, the introduction of hard rice for the European market and, later, of groundnut, both preceded the creation of an agricultural department. So also did the substitution of transplanting for broadcasting in rice cultivation, which became general when the price of paddy rose sufficiently to justify the extra cost. In Africa 'the production of cacao in the Gold Coast and of groundnuts in Northern Nigeria are examples of the development of new industries almost without aid, when the African has been satisfied that production is possible and within his capacity...(and)...this wide adoption of maize and other crops, which are comparatively recent introductions is further evidence of capacity of adaptation'.[3] Where new crops or methods of cultivation are profitable, compulsion and expert assistance are unnecessary; where they are unprofitable, compulsion and expert assistance are of no avail.

General experience shows that even if tropical peoples fail to evince a desire of gain before contact with the West, this is one of the earliest lessons which they learn. For the introduction of new and more profitable crops it is not even necessary that the cultivators themselves should make the profit. Where economic development leads to land alienation and rack-renting, or wherever rents are fixed by competition, the land goes to tenants who can pay the highest rent, and cultivators are compelled therefore to adopt new and more productive crops, or cheaper methods of cultiva-

[1] *Netherlands Indic*, p. 321.
[2] *African Survey*, pp. 864–7, 961.
[3] *Ib.* pp. 883, 886.

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tion, even though the profit goes to the moneylender or the landlord. If an agricultural service can make the cultivation of any crop more profitable either to cultivators or landowners it will increase production; if it does not increase production, the presumption is that it has not enabled cultivators, working under local conditions and with the means at their disposal, to get a better return.

Even in Europe the application of modern science to agriculture is comparatively recent, and practical agriculturists are apt to view the suggestions of experts with suspicion not always unjustified. But the scientific study of tropical agriculture is still in its infancy, and experts must be cautious in their recommendations, for, if they base suggestions on experience in Europe, they are liable to make mistakes. For example, in Europe cultivators prize a warm soil and in the tropics a cool soil, and in other ways conditions are reversed, but specialists are not always capable of adapting to a tropical environment what they have been taught in Europe. In Burma deep ploughing was recommended to rice cultivators, until experience showed that this breaks up the hard pan which holds the water. The early rubber leases in Burma required planters to grow at least 400 trees to the acre, whereas the optimum number was about 80. Western planters condemned the neglect of natives to weed their rubber holdings until the recent depression, by precluding expenditure on the weeding of plantations, taught them that it reduced the yield of sap. Mistakes are accepted as inevitable by western planters, but shake the confidence of native cultivators in western science. There is no doubt that modern science can do much to improve agriculture in the tropics. It has already done much in Netherlands India, where the 'great cultures' have been built up on a scientific basis. But it is European agriculture that chiefly benefits from the modern science of the agricultural service. Naturally agricultural experts can do more for planters who believe in them, seek their help and employ methods of cultivation with which they are familiar, than for peasants who have no faith in modern science and believe, often not unjustly, that they know most about their own job; and just as naturally, where, as formerly in Malaya, there is a choice between helping the planter or the peasant, agricultural officials tend to do the work that is more obviously useful, and prefer to help the planter rather than the peasant.

But the immaturity of scientific agriculture in the tropics, the lack of continuity in policy and experiment, and the prior claims of planters

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to assistance are matters of comparatively small importance. A far more serious obstacle to the success of agricultural experts is their ignorance of tropical economy. Everywhere production is a social function. In Europe we are apt to overlook this fact because our methods of production grow out of our established social life, and, because we do not notice it in Europe, we tend to disregard it in the tropics. The agricultural official is usually an expert in scientific agriculture, but one cannot expect him to have an expert knowledge of native social life. That is not his business; he is an agriculturist and not an economist. Consequently he tries to adapt native life to scientific principles instead of adapting scientific principles to native life, and, if the people do not accept his suggestions, he regards them as unreasonable. Under experimental conditions some new crop or new method of cultivation may seem profitable, but under the conditions of village life it must fit in with the established rotation of crops and with the available supplies of water and labour. In Malaya, for instance, if the new strain of paddy, said by the agricultural service to increase the yield by 30 %, had given corresponding results in practical experience, it is difficult to believe that during the next five years the area under rice would have remained practically constant. In Burma at one time there was a suggestion that sugar palms should be cut down or taxed out of existence, the demand on fuel for sugar boiling was considered uneconomic; fortunately before much harm had been done, it was discovered that palm trees were a stand-by of the cultivator against famine, because drought does not affect the yield until the following year. Similarly, in Africa, 'agricultural experts are becoming more chary of introducing sudden changes in African agricultural technique, for, they say, Europeans lack knowledge of local conditions, and the indiscriminate application of European technique, such as the use of the plough, has in some places had disastrous results'.[1] 'An examination of the present methods used by natives to produce food or cash crops will reveal a planned effort, the balance of which may easily be upset by ill-considered innovations. . . . Such a system is of proved value in native eyes, and is peculiarly adapted to native conditions of life; it needs careful study before improvements can be recommended which are not only sound in themselves but will appeal to the cultivators.'[2] These things lie outside the province of agricultural science, and are not within the competence of experts.

[1] Wilson, p. 118.

[2] *African Survey*, p. 960.

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In other matters not only the agricultural expert but the individual cultivator is helpless, and even the whole village, working as a common unit, can do nothing. Production is a social function that extends beyond the village. In Malaya, as we have noticed, it has been recognized that the problem of making rice cultivation profitable requires the co-operation of numerous departments. (This raises the question of departmentalism, which we shall have to examine more generally.) Another illustration of the wide range of what may appear simple agricultural problems may be found in the marketing of crops. In Burma groundnut, and new varieties of beans and onions spread rapidly, without instigation from the agricultural service, because they found a market and were profitable. But attempts by the agricultural service to introduce chickpea, chillies and tomatoes where there was no market, met with failure, and the cultivators lost their time and labour. Tomatoes are widely grown and in one district cultivators were induced to grow a more productive variety. They obtained larger crops but could not sell them, because the flavour did not appeal to the Burman palate, and there was no local European market. Again, millers wanted a special variety of paddy. The agricultural experts produced a variety to meet their wants, and found cultivators to grow it. But it needed a special adaptation of the milling machinery, and this was impracticable unless the new variety was available in quantities requiring the co-operation of many cultivators over a wide area, so that those who grew it had to accept a lower rate and not, as they had been led to expect, a higher rate for their produce. Every such misadventure shakes confidence.

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For these and other reasons the possibility of increasing native agricultural production through the assistance of an agricultural service are very limited. Similar obstacles beset the veterinary and other services. In general, economic services can increase production only where they appeal to the desire of gain by enabling the people *as individuals* to make more money; even this, as will appear below, does not always imply greater welfare. Many improvements, however, as we have seen, are profitable to individuals only through co-operative or collective action, and many, though possibly tending to increase the total volume of production, are prejudicial to the peoples as individuals. In such cases it is necessary either to appeal to some motive other than the desire of gain, or to employ compulsion. An appeal to social welfare requires conditions that are not easily fulfilled, and becomes more difficult with the increasing 'atomization'

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654 of native social life; ordinarily therefore a remedy is sought in compulsion.

The resort to compulsion for improving output raises new difficulties. Where the expert aims at helping the cultivator to earn more, both have a common object, and the results are readily apparent and can be measured by the standard of profit, which both recognize. If the expert tells the cultivator that some new variety will give a larger yield or fetch a better price, the results soon test the value of his counsel. It is a different matter when experts recommend measures that may possibly improve production in general over a long period, but require time to test their value and, in the first instance, entail trouble or loss to individuals.[1] If they advocate the eradication of dangerous weeds, the use of chemicals for spraying, the destruction of diseased crops, the cutting down of oil palms to protect the market, the inoculation of cattle at the risk of death, the castration of undesirable sires, or the slaughter of cattle to prevent infection, the benefits are distant and uncertain, and the disadvantages immediate and obvious. In such matters they cannot expect the co-operation of the people, but must rely on inspection by a costly staff of numerous subordinates on low pay, ignorant and probably corrupt. Under indirect rule they may enlist the help of native chieftains, but this, like all attempts to employ the chieftains as agents of western policy, tends to undermine traditional authority. Finally, the success of measures of this kind depends not on blind obedience but on genuine acceptance through a recognition of their value. If the regulations intended to promote efficiency are sound, one would expect Europeans to comply with them more readily than natives, yet it seems that in some matters there is least progress on European estates, 'where control is much more difficult to exercise'.[2]

654 241 Measures to make production more profitable may gain acceptance if in the long run they show a profit to individuals, even though entailing a temporary loss; it is true also that, so long as a communal sentiment survives, individuals may acquiesce in personal loss for the benefit of the community. In time, if possibly a long time, the value of such measures can be demonstrated, and assessed in terms of money. But it is a different matter to increase the production of unprofitable crops. In such cases the agricultural service and the cultivators have no common standard. If it is difficult and dangerous to interfere in native economy where output and profit, debt and land

[1] *African Survey*, pp. 912, 934, 937. [2] *Ib.* p. 970.

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alienation provide comparatively simple tests of the results, the objections are much stronger where experts run counter to the profit motive, and where their recommendations are based, not on agricultural or veterinary science, but on western views as to the nature and purpose of tropical economy. The attempt has often been made and often, perhaps invariably, failed. In Java in the reaction against the Culture system 'officials were so zealous in promoting the cultivation of rice rather than export crops as to insist on the cultivation of long-lived paddy, even where the soil or water supply was unsuitable'.[1] In Malaya, rice land was found to be going out of cultivation although regulations enforcing the cultivation of rice had been imposed for over thirty years. To-day history is repeating itself in Africa. 'The expansion in the growth of marketable crops has seemed to be leading to a dangerous reduction in subsistence crops', and 'there is to-day a much clearer recognition of the need for organizing subsistence production.' Accordingly provisions for the encouragement of subsistence crops have been framed in Northern Rhodesia, Tanganyika and Uganda.[2] Whether they will have greater success in Africa than in Java or Malaya time will show. They are unlikely to strengthen the authority of the native dignitaries enforcing them, or to foster affection towards the western Government responsible for preventing cultivators from turning their labours to the most profitable account; nor are they likely to make the agricultural service popular or to facilitate its work in other matters.

Moreover, in directing economic activities along these lines, it is hard to escape bias, and still harder to escape the suspicion of bias. When Europeans try to 'prevent the unwise extension of the growth of economic crops',[3] they are inevitably exposed to the unpleasant suggestion that they are chiefly considering western interests. We have seen that, in Malaya, it was the loss sustained by Government and the planters through the neglect of subsistence crops, that stimulated activity in promoting rice cultivation. In Africa interest in food crops grew with the need for healthy labour. Measures to encourage subsistence crops may easily be interpreted as meant to discourage unwelcome competition, and the more so because at various times the planting interest has, in fact, opposed the native cultivation of sugar, rubber and coffee. Even with the best intentions

[1] *Netherlands India*, p. 167.
[2] *African Survey*, p. 631; *Britain and Her Dependencies*, p. 23.
[3] *African Survey*, pp. 635, 887, 978.

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654 241 it is obviously no easy matter to decide whether the extension of cultivation for the market is wise or unwise, and, in view of the generally inadequate acquaintance with native social and economic life and the deficiency and inaccuracy of tropical statistics, the material for a sound decision is unlikely to be available.

The foregoing remarks deal mainly with native agriculture, but this is the chief occupation in the tropics and has received most attention from colonial administrations. Similar considerations apply to other economic services intended to promote native enterprise. Undoubtedly native production grows, and often very rapidly, under western rule. But this is the natural result of greater security of life and property, and of the opening up of new markets, and in the past it has grown rapidly without the help of economic services, as the stimulus given by western rule to the desire of gain has been sufficient. The application of modern scientific methods to native enterprise should make it more efficient. That is the function of economic services. In practice, however, their contribution to the increase of production is confined within narrow limits. They can increase production only by making it more profitable to individuals and for various reasons, some of which we have noticed, this is rarely possible except in such matters as the introduction of new crops, which does not call for expert knowledge. Economic services can and do render much help to western enterprise, and they are useful instruments of progress; but they can do comparatively little to improve native enterprise. Thus the argument that development is necessary to provide funds for economic services in the interest of native enterprise is of doubtful validity and requires closer scrutiny than it usually receives.

4. Economic Services and Welfare

654 571 Unless economic services make native production more efficient, they obviously must be ineffective in enhancing welfare. But they may promote efficiency by increasing production or in other ways without contributing to native welfare, and may even have contrary results. In Malaya, so far as the agricultural service enabled cultivators to obtain a larger yield, it did not enable them to make a greater profit. One obstacle was a ring of Chinese mill owners.[1] 'The Malay had no option save to sell at the price offered by the middleman

[1] Mills, pp. 255. 261.

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THE PEASANTRY OF SOUTH EAST ASIA [1]

PROFESSOR RAYMOND FIRTH, F.B.A.

IF it is not wholly true that the social and economic reconstruction which is so necessary in Asia today must begin with the peasant, it is certain that no programme which omits the peasant can be on firm foundations. The recent history of China is evidence enough for this. My concern, as a social anthropologist, is with the analysis and classification of social relations between people and groups of people, rather than with political or economic affairs as such, although inevitably I cannot disregard them. So my aim is to show briefly some of the most important aspects of the social organization of the South East Asian peasant communities, and of the values by which this organization works. Though the details in my paper refer mainly to Malaya and Indonesia, I think the generalizations have some value for the South East Asian region as a whole.

If the basic features of the peasant society are ignored, one can understand neither the peculiar tenacity which it still possesses in modern conditions, nor the reactions of its members to the increasing impact of external economic and political forces. The definition of a peasant is a countryman—a man engaged in rural pursuits, primarily agriculture, with a comparatively simple technology and a special interest in the land he works. In South East Asia one may extend the application of the term to cover the majority of fishermen and even village craftsmen too. They are of the same social class as the agriculturalists, and often members of the same families. As occupational groups, they may even be separable only in theory, since many a peasant farmer is also a fisherman or craftsman by turns, as his seasonal cycle or his cash-needs influence him. What R. H. Tawney has said of agriculture—that it is at once a craft, a business, and a manner of life—can be applied more widely here; the problems of all these peasants alike are partly technical, partly financial and commercial, and partly cultural and social.

It is difficult to say just what proportion of the present population of South East Asia may be classed as peasants. It would seem that in nearly every South East Asian country two-thirds or more of the total population is to be found in agricultural communities, tilling the soil. In 1930 the census of Java and Madura in Indonesia gave about 70 per cent of the male workers as dependent for their livelihood on native agricultural output, and about 75 per cent in the regions of Indonesia outside Java and Madura, while large numbers of women were engaged in home craft production. In Siam, in about 1930, almost 90 per cent of the population lived in agricultural communities, rice production providing the living of about 80 per

[1] Originally delivered at a meeting at Chatham House on 21 February 1950.

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cent of the population. Malaya, of course, is exceptional, because of the especially heavy concentration on the production of rubber and tin. According to the 1947 census of Malaya, about 34 per cent of the working population were classed as cultivators and fishermen working on their own account or as unpaid members of families. In all, I think one could reckon that rather more than 100 million people in South East Asia can be regarded as peasantry.

Throughout all this region, peasant technology is simple; skills, though traditionally well adapted to the job in hand, are of limited range. Soils, despite the richness of some of the swamps and river flood-plains, are generally of poor quality. The system of felling and burning the jungle, taking off crops for a few years, and then moving away to cultivate fresh clearings while the old ones revert to jungle, is still common in the mountain areas of Burma, Malaya, and Siam, in part of West Java, in much of Borneo, and in the outer islands of Indonesia. It is known as shifting cultivation or jungle-fallowing. Although regarded as extremely primitive, it is an economic use of land in areas of low population density, where plentiful land allows of long rotation of clearings and consequent restoration of soil fertility. But where population is dense, the system cannot provide the necessary volume of production without endangering the future soil capital, and that is one of the major problems of the area. In the more sedentary forms of agriculture, fertility is conserved with a great deal of care, by manuring, by water control, and so on. Sometimes there is very elaborate and spectacular terracing, as in parts of the Philippines or in Bali, where the native cultivator through his own efforts through generations has known how to make the best of the land with his available techniques. Yet many of these techniques are only of limited efficiency, and custom may be a barrier to improvement. For large masses of the Muslim peasantry of South East Asia, for instance, the pig, an excellent economic converter of resources, is taboo for religious reasons.

Productivity of the South East Asian peasant is apt to be low, whether considered in terms of the margins required above subsistence to give him and his family the range of goods and services they want, or by comparison with Western results. It is hard to make this last comparison significant because of the differing bases, but the following figures will give, perhaps rather superficially, some idea of the comparison. In terms of cwt. of cropping per acre, for instance, the rice crop of part of South East Asia can be compared roughly with the wheat crop of Western Europe. The figures are taken from different years, but they can be regarded as significant averages. Java at 12 cwt. of rice to the acre corresponds with France at 12 cwt. of wheat to the acre; Siam at 14 cwt. to the acre with the United Kingdom at 18 cwt. and Germany at a little less; Japan at 27 cwt. of rice per acre corresponds to Denmark with 27 cwt. of wheat per acre. Yet rice is supposed to be a crop of much higher yield. What is more significant is that productivity per acre in both Malaya and Indo-China is only 10 cwt. on the average, or only between one-third and one-half of the average in Japan.

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on the average, or only between one-third and one-half of the average in Japan. 000

Moreover, in any comparison between South East Asia and the peasantry of Europe, quite apart from differences in the production of crops other than the staple grain, there is an important difference in the average size of the holdings worked. The South East Asian peasant has fewer acres than the peasantry of Europe. In France, a country of peasant agriculture, about 40 per cent of the total number of agricultural holdings in 1931 were less than 2½ acres apiece; the average size of this group of holdings was 1½ acres each. But about 45 per cent of the total holdings were between 2½ and 22½ acres, with an average of about 10 acres each. There are areas in South East Asia where the average size of peasant holdings is fairly large. In Cochin China, while 72 per cent of the landowners have holdings between 2½ and 12 acres, there are provinces where more than half of them have holdings above 12 acres in size. In Siam, too, the average peasant holding seems of tolerable size—4 acres or so in the south and north east, 5½ acres in the north, and 10½ acres in central Siam, where more than one-third of the rural families live. But in Java, in 1938, the average size of holdings was only just over 2 acres for all tax-paying landowners in the country. In the Tonkin delta of Indo-China, another large area of heavy concentration of peasantry, as much as 60 per cent of the peasants have been reckoned to own holdings of less than nine-tenths of an acre, and 90 per cent to have holdings of under 4½ acres apiece. It has been estimated that a peasant family needs for adequate support 2½ to 5 acres of land, cultivating it by 'wet rice' methods. Many sections of the farming population in Java and Indo-China, for instance, are obviously well below this critical level. Even though large-scale irrigation and very intensive land use, including double cropping of rice in the year and much use of secondary crops, may lower the critical figure considerably, the peasant in such conditions is always liable to have to seek work outside his holding or to put up with inadequate living standards, even in nutrition. 311 241 ● 433 565 361

The difficulties of agriculture in such conditions are further increased by the fact that a man's holding is often not a single undivided farm, but a set of dispersed fields, some of very small size. This dispersion and fragmentation of holdings allows for some advantages in adapting crops to soil and water variations, and is some security against wholesale raids by pests, but it makes for technical difficulties in the use of implements and labour on any scale. Since the dispersion is due primarily to traditional customs of inheritance and marriage, efforts to secure consolidation are apt to be only of temporary benefit, though some success has attended administrative action against undue fragmentation.

The same comparatively low level of productivity is seen in fishing, which gives the one great source of animal protein to the South East Asian peasant's diet. Before the war a Malay peasant fisherman produced on the average 1½ tons of fish per head per annum and in 1947 nearly 1 ton per 433 226 565

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Chinese

427 But the alien planta-
565 tions and even alien smallholders have threatened to grasp at it, and the
177 advances of Western medicine, so beneficial in many ways, have only accelerated the rate of increase of the population which has to seek a livelihood from it. In most parts of South East Asia the peasant is the actual owner of the land he tills, often legally under some agreement with
426 the State. But his rights to the produce are often severely limited by a heavy burden of indebtedness. The real effects of this may be less than people sometimes think, because when the debts are spread among neighbours and kinsfolk interest may be waived, repayment is sometimes protracted or ignored, and the debt may be serviced by other than material means. But there is no doubt that the peasant producer is badly hampered by his debt load. It is most pressing when debt is contracted to a member of an alien ethnic group, an Indian or a Chinese, for whom the transaction is a purely commercial one.

563 The role of alien Asiatic ethnic groups is one of the most significant
565 features in the economic and political life of the peasantry of South East
177 Asia today. For many centuries, Indian and Chinese trading influences
178 have met in the South East Asian region, and Indian religious concepts
439 have penetrated deep into many of its social systems. But for more than four hundred years the dominant commercial and political note has tended to be sounded by Europeans. Now the balance is altering. Colonialism may have set the modern structure of South East Asian society, but the patterns will persist when the colonial Powers have withdrawn. To this new society the Chinese above all have the economic key. In Indo-China, Siam, Malaya, the Philippines, and Java, the Chinese have penetrated the economic system and taken over crucial functions. They have shared in much of the wholesale import trade, they have attained pre-eminence in retailing vital imported goods to the peasant, and they act as middlemen for the collection, storage, and processing of peasant export products. As part of this process they often finance the peasant producer by advances on his crop, gaining a double profit by giving part of these advances in goods, not cash. The Chinese achievement has been remarkable. They have been kept on the margin both of the peasant society with which they deal, and of the European society with which at a later stage their growing wealth would allow them to associate. Though lacking any formal political power, which in the Orient as elsewhere is so often the passport to success, they have built up a trading structure of extraordinary toughness, elasticity, and elaboration.

565 The wider political implications of this are not my concern here. But
609 it is important to note three points in connexion with the peasant theme.
186 One is the xenophobic reaction of the local urban dwellers and of peasants
578 too, which has periodically found expression against the Chinese, as traders or residents in South East Asia, in the form of riots and other disturbances.
563 Another is the reaction of the Chinese, whose economic strength has given
241 them confidence, and who are now prepared to stand by their claim to a

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real stake in the countries of the Nan Yang, as settled members of the local society, and not as aliens. The third point is that the Chinese community has never been one of middlemen only; there has always been a fair proportion of cultivators within it. The poor peasantry of South East Asia now includes a Chinese as well as an indigenous element. The 1947 census of Malaya shows 45,000 Chinese engaged in rice growing, and another 100,000 in market gardening and fishing, essentially peasant pursuits.

The pressure to which the South East Asian peasant has been subjected by the combination of Western and other alien influences has been severe. But we must beware lest we misinterpret it. In a recent book which gives a comparative analysis of the agrarian situation in the countries of South East Asia, appears a striking statement about Malaya—that development of mining and rubber industries has pushed the native Malay population more and more towards the east, into the areas of the former Unfederated Malay States: 'The Malays', it is said, 'considered the east as safe from Western penetration, and therefore preferred this undeveloped area to the irrigated lands on the western coast, mainly because there they could get only temporary land licences, since a complete survey of all potential tin-bearing regions had not yet been made'.[1]

It is true that the eastern States are predominantly Malay in population, and that the greater part of the vast immigrant population of Malaya is densely settled on the western side of the peninsula, where the resources are richer and access easier than on the eastern side. It is also true that there has been some lack of enthusiasm among Malay peasants to colonize the new Government-developed irrigation areas, for complex reasons, including lack of capital in the past, and disinclination to move from their ancestral homes. But it is quite incorrect to put these facts together and to argue that the Malay has been pushed by alien pressure over from the west to the east of the peninsula. Apart from some seasonal movement for rice harvesting or fishing, the internal migration of Malays is inconsiderable, despite the rapid development of communications in recent years. Both the 1931 and the 1947 census show that whatever movement takes place—well under 10 per cent—is almost wholly from one State to another, either on the west coast or on the east coast, or to Singapore. Hardly any movement at all occurs from the west to the east. Moreover, the 1947 census shows that between 1931 and 1947 the Malay population of the western States increased by about one-third, at a rate slightly higher than that of the eastern States. The proportion of Malays in these western States, in terms of the total population of all ethnic groups, also increased slightly during this period, due primarily to the decline of Indians and Indonesians. In other words, though foreign economic penetration has immersed the western Malay in a flood of alien elements, it has not driven him away. On the contrary, he has preferred to stay and await events.

[1] Erich H. Jacoby, *Agrarian Unrest in Southeast Asia* (New York, Colombia University Press, 1949) p. 113.